Nokia Customer Care
6015/6015i/6016i/6019i (RH-55), 6012 (RM-20) Series Transceivers

Troubleshooting - Baseband

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Troubleshooting Overview

The baseband module for the 6015/6015i/6015i/6019i, and 6012 transceivers include the following:

Model	Type	Technology	Memory	Frequency (MHz)	GPS Module
6012	RM-20	Analog and CDMA IS2000	Discrete Flash: 64 Mb SRAM: 4 Mb	800	No
6015	RH-55	Analog and CDMA IS2000	Discrete Flash: 64 Mb SRAM: 4 Mb	800/1900	No
6015i	RH-55	Analog and CDMA IS2000	Combo Flash: 64 Mb SRAM: 16 Mb	800/1900	Yes
6016i	RH-55	Analog and CDMA IS2000	Combo Flash: 64 Mb SRAM: 16 Mb	800/1900	Yes
6019i	RH-55	Analog and CDMA IS2000	Combo Flash: 128 Mb SRAM: 16 Mb	800/1900	Yes

The baseband consists the following main Application Specific Integrated Circuits (ASICs):

- Universal Energy Management (UEM)
- Universal Phone Processor (UPP)
- FLASH and SRAM memory

The baseband architecture is based on the DCT4 Universe engine and supports a power-saving function called *sleep mode*. Sleep mode shuts off the VCTCXO, which is used as a system clock source for both the RF and the baseband. The phone awakens by a timer running from this 32 kHz clock. The sleep time is determined by network parameters. During the sleep mode, the system runs from a 32 kHz crystal. The phone enters sleep mode when both the MCU and the DSP are in standby mode, and the 19.2 MHz Clk (VCTCXO) is switched off.

The 6015/6015i/6015i/6019i, and 6012 support both 2- and 3-DCT3 type wire chargers. However, the 3-type wire chargers are treated as 2-type wire chargers. The UEM ASIC and EM SW control charging.

A BL-6C Li-ion battery is used as the main power source. The BL-6C has a nominal capacity of 1070 mAh.

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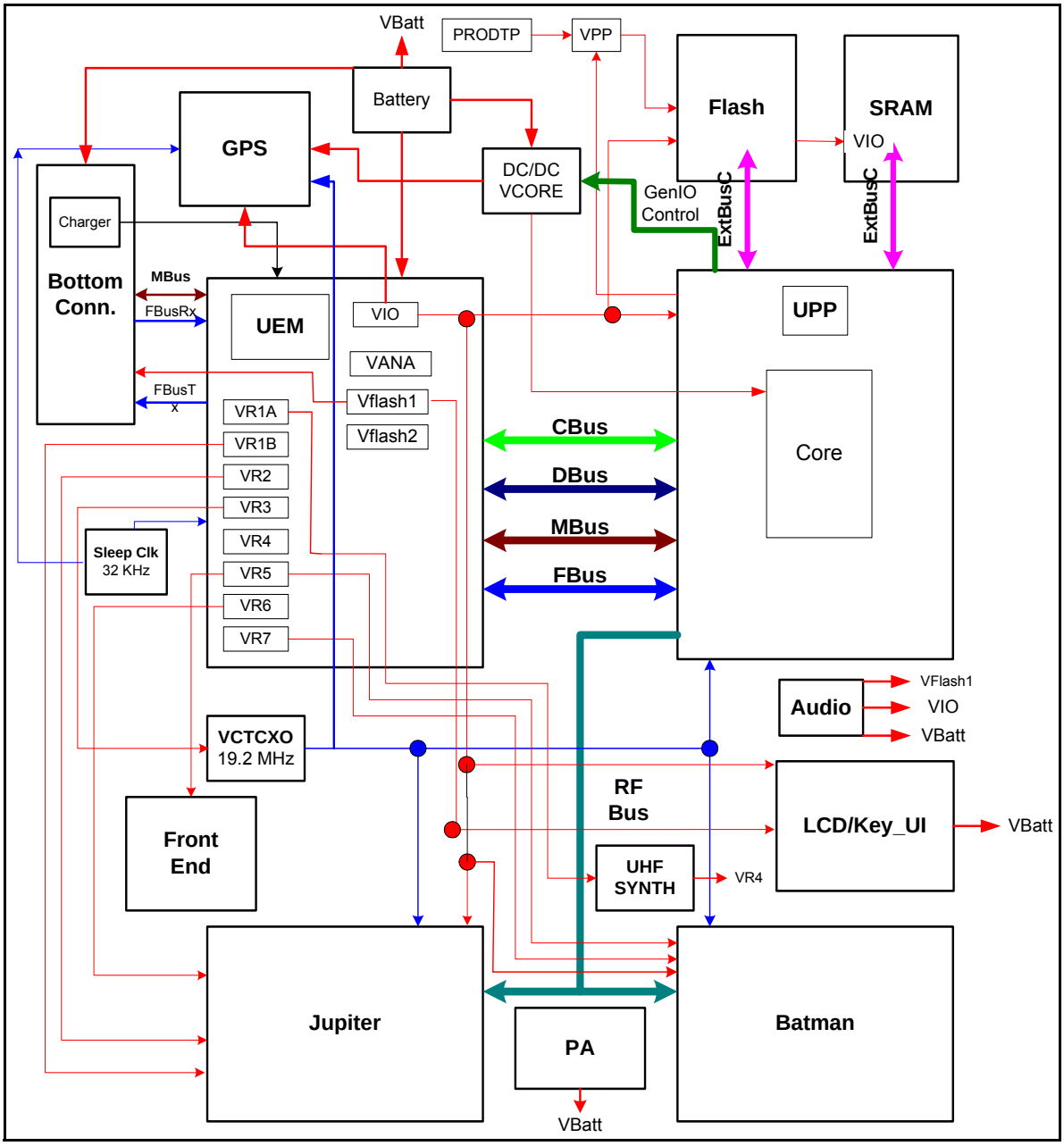

Figure 1: Baseband power distribution

Power Up and Reset

Power up and reset are controlled by the UEM ASIC. The baseband can be powered up in the following ways:

- By the Power button, which means grounding the PWRONX pin of the UEM
- By connecting the charger to the charger input
- By the RTC alarm, when the RTC logic has been programmed to give an alarm

After receiving one of the above signals, the UEM counts a 20ms delay and enters into reset mode. The watchdog starts up, and if the battery voltage is greater than Vcoff+, a 200ms delay starts to allow references (etc.) to settle. After this delay elapses, the VFLASH1 regulator is enabled. Then 500us later the VR3, VANA, VIO, and VCORE are enabled. Finally, the PURX (Power Up Reset) line is held low for 20 ms. This reset (PURX) is fed to the baseband ASIC UPP. Resets are generated for the MCU and the DSP. During this reset phase, the UEM forces the VCTCXO regulator on — regardless of the status of the sleep control input signal — to the UEM.

The FLSRSTx from the ASIC is used to reset the flash during power up and to put the flash in power down during sleep. All baseband regulators are switched on when the UEM powers on. The UEM internal watchdogs are running during the UEM reset state, with the longest watchdog time selected. If the watchdog expires, the UEM returns to the power-off state. The UEM watchdogs are internally acknowledged at the rising edge of the PURX signal in order to always give the same watchdog response time to the MCU.

Figure 2 represents the UEM start-up sequence from reset to power-on modes.

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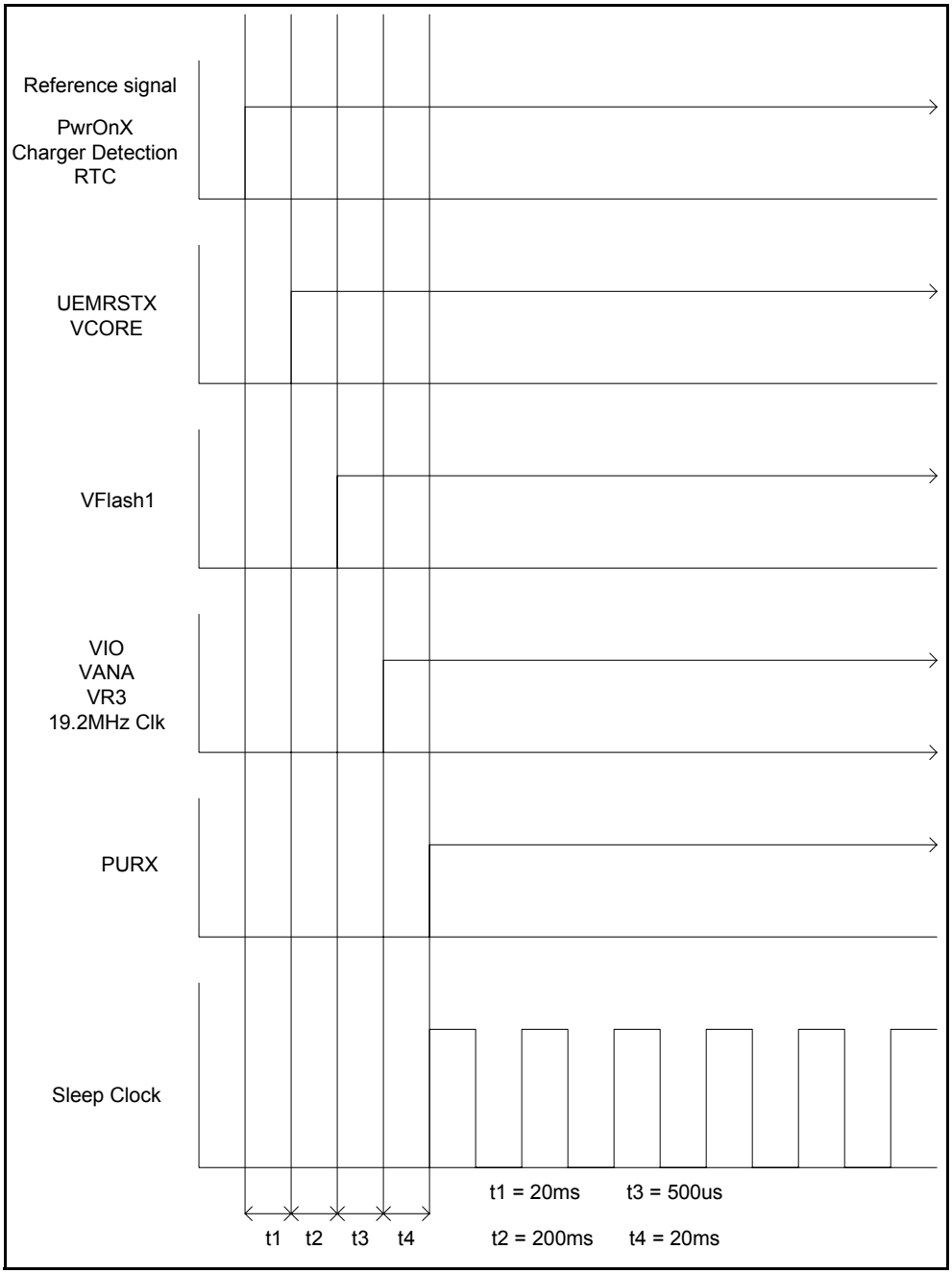

Figure 2: UEM start-up sequence

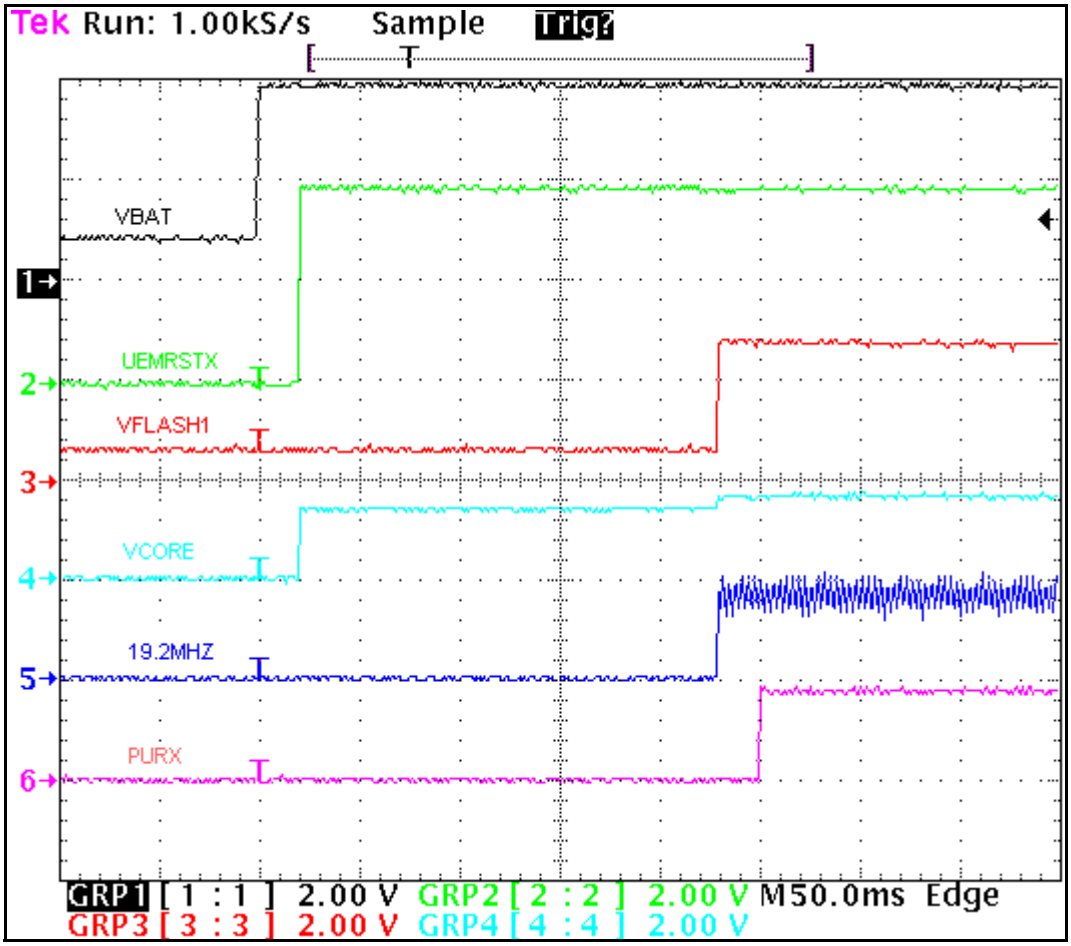

Figure 3: Power up

Power Up – Power Key

When the power key is pressed, the UEM enters the power up sequence. Pressing the power key causes the PWRONX pin on the UEM to be grounded. The UEM PWRONX signal is not part of the keypad matrix. The power key is only connected to the UEM, which means that when pressing the power key, an interrupt is generated to the UPP that starts the MCU. The MCU then reads the UEM interrupt register and notices that it is a PWRONX interrupt. Then the MCU reads the status of the PWRONX signal using the UEM control bus (CBUS). If the PWRONX signal stays low for a specific duration, the MCU accepts this as a valid power on state and continues with the SW initialization of the baseband. If the power on key does not indicate a valid power on situation, the MCU powers off the baseband.

Power Up – Charger

In order to be able to detect and start charging in the case where the main battery is fully discharged (empty) and hence the UEM has no supply (NO_SUPPLY or BACKUP mode of UEM), charging is controlled by START-UP CHARGING circuitry.

Whenever a VBAT level is detected to be below master reset threshold (V_{MSTR-}), charging starts and is controlled by START_UP charge circuitry. Connecting a charger

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forces the VCHAR input to rise above the charger detection threshold (VCH_{DET+}) and by detection charging is started. The UEM generates 100 mA constant output current from the connected charger's output voltage. The battery's voltage rises as it charges, and when the VBAT voltage level is detected to be higher than the master reset threshold limit (V_{MSTR+}), the START_UP charge is terminated.

Monitoring the VBAT voltage level is done by the charge control block (CHACON). A MSTRX='1' output reset signal (internal to the UEM) is given to UEM's RESET block when VBAT>V_{MSTR+} and the UEM enter into the reset sequence.

If VBAT is detected to fall below V_{MSTR-} during start-up charging, charging is cancelled. It will restart if new rising edge on the VCHAR input is detected (VCHAR rising above VCH_{DET+}).

Power Up - RTC Alarm

If phone is in POWER_OFF mode when an RTC alarm occurs, a wake-up procedure begins. After the baseband is powered ON, an interrupt is given to the MCU. When an RTC alarm occurs during ACTIVE mode, an interrupt is generated to the MCU.

Power Off

The baseband switches into power off mode if any of following occurs:

- Power key is pressed
- Battery voltage is too low (VBATT < 3.2 V)
- Watchdog timer register expires

The UEM controls the power down procedure.

Power Consumption and Operation Modes

Power Off

During power off mode, power (VBAT) is supplied to the UEM, BUZZER, VIBRA, LED, PA and PA drivers. During this mode, the current consumption is approximately 35 uA.

Sleep Mode

In sleep mode, both processors (MCU and DSP) are in stand-by mode. The phone enters sleep mode only when both processors make this request. When the SLEEPX signal is detected low by the UEM, the phone enters SLEEP mode. The VIO and VFLASH1 regulators are put into low quiescent current mode, VCORE enters LDO mode, and the VANA and VFLASH2 regulators are disabled. All RF regulators are disabled during SLEEP mode. When the UEM detects a high SLEEPX signal, the phone enters ACTIVE mode and all functions are activated.

The sleep mode is exited either by the expiration of a sleep clock counter in the UEM or by some external interrupt (a charger connection, key press, headset connection, etc.).

In sleep mode, the VCTCXO (19.2 MHz Clk) is shut down and the 32 kHz sleep clock oscillator is used as a reference clock for the baseband.

The average current consumption of the phone can vary depending mainly on the SW state. However, the average consumption is about 6 mA in slot cycle 0.

Active Mode

In active mode, the phone is in normal operation; scanning for channels, listening to a base station, and transmitting and processing information. There are several sub-states in the active mode depending on the phone's present state, such as burst reception, burst transmission, if DSP is working, etc.

In active mode, SW controls the UEM RF regulators: VR1A and VR1B can be enabled or disabled. These regulators work of the UEM charge pump. VSIM can be enabled or disabled and its output voltage can be programmed to be 1.8 V or 3.3 V. VR2 and VR4–VR7 can be enabled, disabled, or forced into low quiescent current mode. VR3 is always enabled in active mode and disabled during sleep mode and cannot be controlled by SW.

Charging Mode

Charging mode can be performed in parallel with any other operating mode. A BSI resistor inside the battery indicates the battery type/size. The resistor value corresponds to a specific battery type and capacity. This capacity value is related to the battery technology.

The battery voltage, temperature, size and charging current are measured by the UEM, and the UEM charging algorithm controls it.

The charging control circuitry (CHACON) inside the UEM controls the charging current delivered from the charger to the battery. The battery voltage rise is limited by turning the UEM switch off when the battery voltage reaches 4.2 V. The charging current is monitored by measuring the voltage drop across a 220 mOhm resistor.

Power

In normal operation, the baseband is powered from the phone's battery. The battery consists of one Lithium-Ion cell. The battery capacity is 1070 mAh.

The UEM ASIC controls the power distribution to the whole phone through the BB and RF regulators excluding the power amplifier (PA) and the DC/DC, which have a continuous power rail directly from the battery. The battery feeds power directly to the following parts of the system:

- UEM
- PA
- DC/DC
- Buzzer

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- Vibra
- Display and keyboard lights

The UEM is the heart of the power distribution to the phone, which includes all the voltage regulators. The UEM handles power-up hardware functions so the regulators are not powered and the power-up reset (PURX) is not released if the battery voltage is less than 3 V.

The baseband is powered from five different UEM regulators:

Table 1: Baseband Regulators

Regulator	Maximum Current (mA)	Vout (V)	Notes
VCORE DC/DC	300	1.35	The power-up default value is 1.35V. The output voltage is selectable: 1.0V/1.3V/1.5V/1.8V.
VIO	150	1.8	Enabled always except during power-off mode
VFLASH1	70	2.78	Enabled always except during power-off mode
VFLASH2	40	2.78	Enabled only when data cable is connected
VANA	80	2.78	Enabled only when the system is awake (off during sleep and power-off modes)
VSIM	25	3.0	Enabled during power-up mode and scanning for a SIM card

Table 2 includes the UEM voltage regulators used by the RF.

Table 2: RF Regulators

Regulator	Maximum Current (mA)	Vout (V)	Notes
VR1A	10	4.75	Enabled when the receiver is on
VR1B	10	4.75	Enabled when the transmitter is on
VR2	100	2.78	Enabled when the transmitter is on
VR3	20	2.78	Enabled when SleepX is high
VR4	50	2.78	Enabled when the receiver is on
VR5	50	2.78	Enabled when the receiver is on
VR6	50	2.78	Enabled when the transmitter is on
VR7	45	2.78	Enabled when the receiver is on

A charge pump used by VR1A is constructed around the UEM. The charge pump works with Cbus (1.2 MHz Clk) and gives a 4.75 V regulated output voltage to the RF.

Clock Distribution

RFClk (19.2 MHz Analog)

The baseband's main clock signal is generated from the VCTCXO (G501). This 19.2 MHz clock signal is generated at the RF and fed to the UPP's RFCLK pin and the GPS BB ASIC.

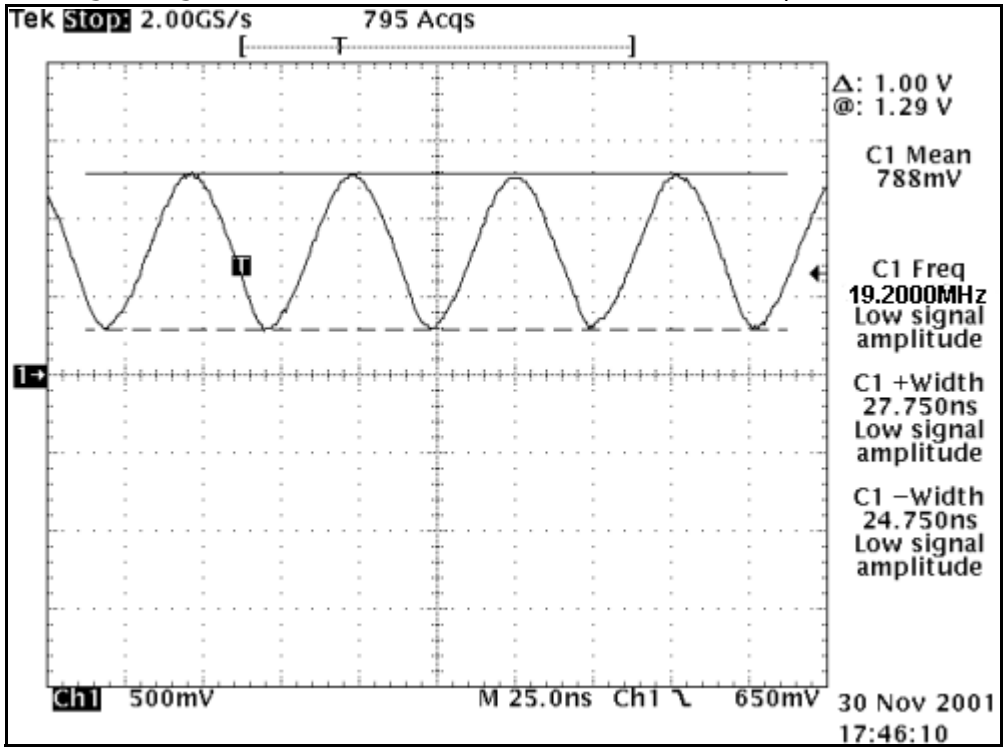


Figure 4: 19.2 MHz analog

RFConvClk (19.2 MHz digital)

The UPP distributes the 19.2 MHz Clk to the internal processors, DSP, and MCU, where SW multiplies this clock by seven for the DSP and by two for the MCU.

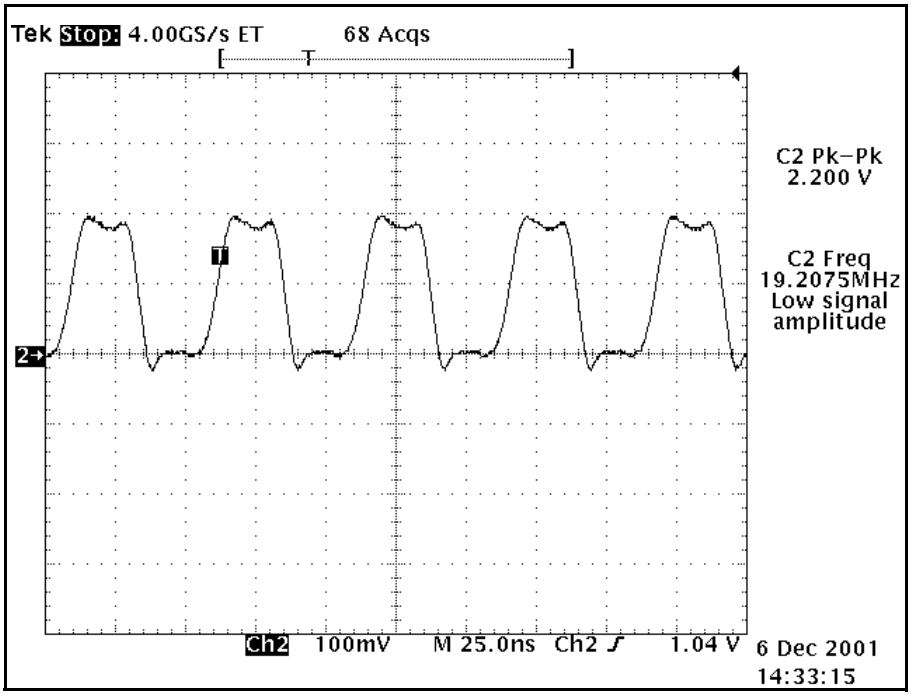


Figure 5: 19.2 MHz digital

CBUSClk Interface

A 1.2 MHz clock signal is used for CBUS, which is used by the MCU to transfer data between the UEM and UPP.

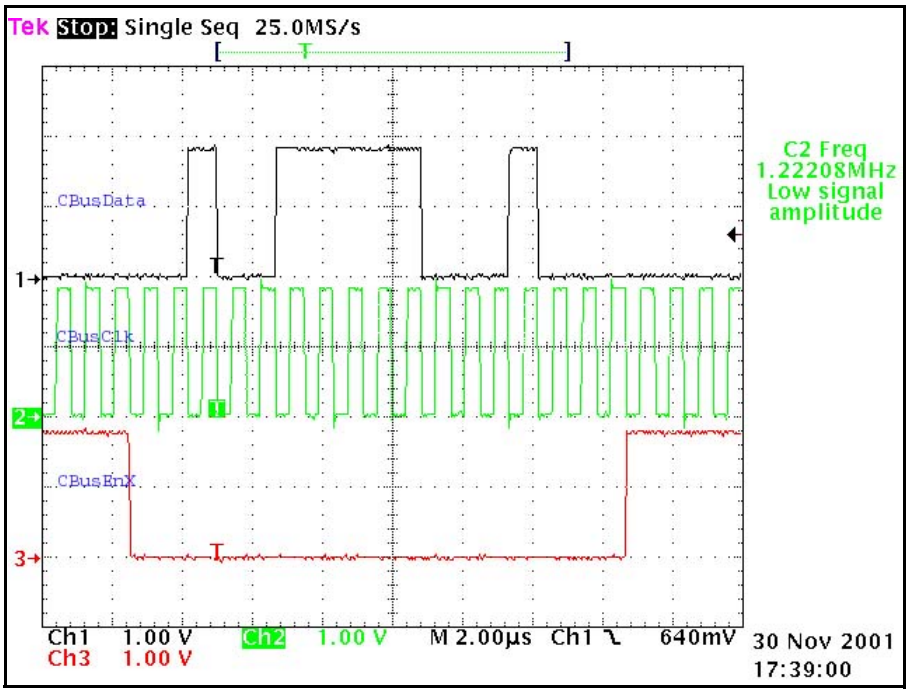


Figure 6: 1.2 MHz CBUS clock signal

DBUS Clk Interface

A 9.6 MHz clock signal is used for DBUS, which is used by the DSP to transfer data between the UEM and the UPP.

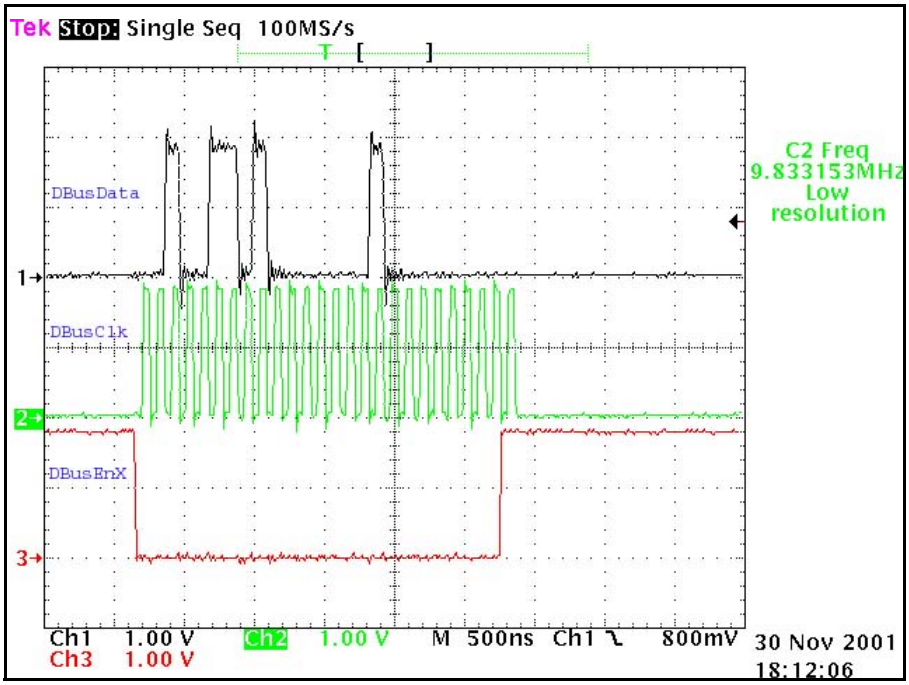


Figure 7: 9.6 MHz DBUS clock signal

The system clock can be stopped during sleep mode by disabling the VCTCXO power supply from the UEM regulator output (VR3) by turning off the controlled output signal SLEEPX from the UPP.

SleepCLK (Digital)

The UEM provides a 32 kHz sleep clock for internal use and to the UPP, where it is used for the sleep mode timing.

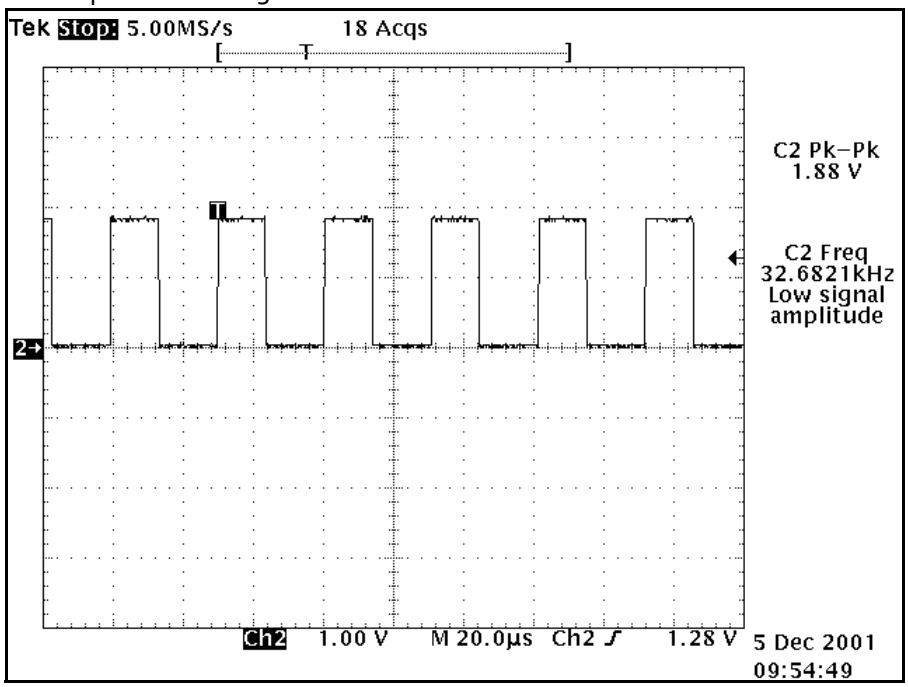


Figure 8: 32 kHz digital sleep clock signal

SleepCLK (Analog)

When the system enters sleep mode or power off mode, the external 32 KHz crystal provides a reference to the UEM RTC circuit to turn on the phone during power off or sleep mode.

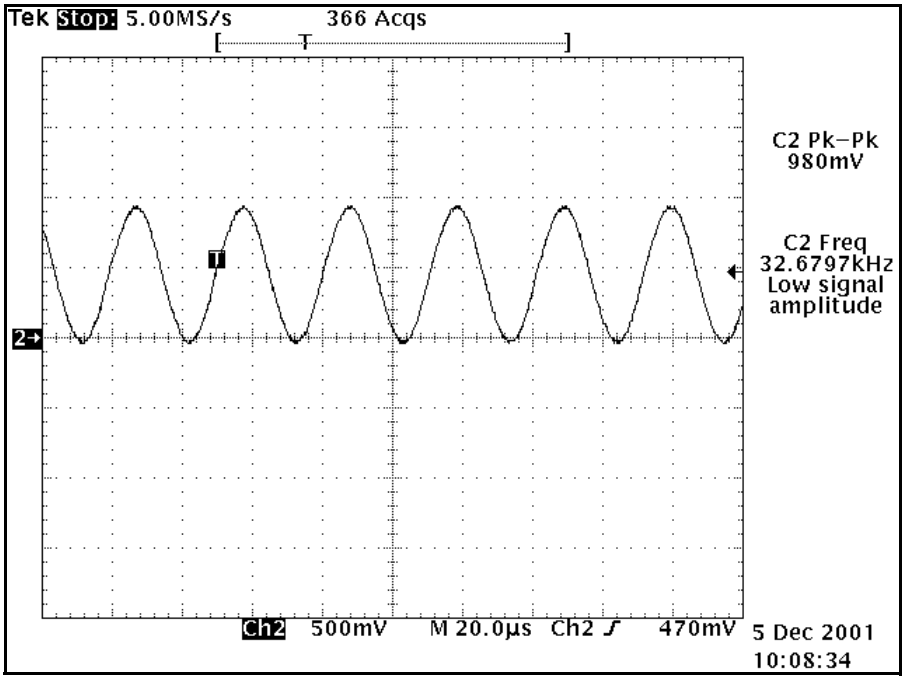


Figure 9: 32 KHz analog sleep clock signal

Flash Programming

Connections to Baseband

The Flash programming equipment is connected to the baseband using test pads for galvanic connection. The test pads are allocated in such a way that they can be accessed when the phone is assembled. The flash programming interface consists of the VPP, FBUSTX, FBUSRX, MBUS, and BSI connections to connection to the BB through the UEM, which means that the logic voltage levels correspond to 2.78 V. Power is supplied to the phone using the battery contacts.

Baseband Power Up

The baseband power is controlled by the flash prommer in production and in reprogramming situations. Applying supply voltage to the battery terminals causes the baseband to power up. Once the baseband is powered, flash programming indication begins (see the following "Flash Programming Indication" section).

Flash Programming Indication

Flash programming is indicated to the UPP using the MBUSRX signal between the UPP and UEM. The MBUS signal from the baseband to the flash prommer is used as a clock for the synchronous communication. The flash prommer keeps the MBUS line low during UPP boot to indicate that the flash prommer is connected. If the UPP MBUSRX signal is low on the UPP, the MCU enters flash-programming mode. In order to avoid accidental entry to the flash-programming mode, the MCU only waits for a specified time to get

input data from the flash prommer. If the timer expires without any data being received, the MCU continues the boot sequence. The MBUS signal from the UEM to the external connection is used as a clock during flash programming. This means that the flash programming clock is supplied to the UPP on the MBUSRX signal.

The flash prommer indicates flash programming/reprogramming to the UEM by writing an 8-bit password to the UEM. The data is transmitted on the FBUSRX line and the UEM clocks the data on the FBUSRX line into a shift register. When the 8 bits have been shifted in the register, the flash prommer generates a falling edge on the BSI line. This loads the shift register content in the UEM into a compare register. Programming starts if the 8-bits in the compare register match with the default value preset in the UEM. At this point the flash prommer pulls the MBUS signal to UEM low in order to indicate to the MCU that the flash prommer is connected. The UEM reset state machine performs a reset to the system, PURX low for 20 ms. The UEM flash programming mode is valid until the MCU sets a bit in the UEM register that indicates the end of flash programming. Setting this bit also clears the compare register in the UEM, which was loaded at the falling edge of the BSI signal. The UEM watchdogs are disabled during the flash programming mode. Setting the bit indicating the end of flash programming enables and resets the UEM watchdog timer to its default value. Clearing the flash programming bit also causes the UEM to generate a reset to the UPP.

The BSI signal is used to load the value into the compare register. In order to avoid spurious loading of the register, the BSI signal is gated during the UEM master reset and during power on when PURX is active. The BSI signal should not change states during normal operation unless the battery is extracted. In this case the BSI signal will be pulled high. Note that a falling edge is required to load the compare register.

Flashing

Flash programming is done through the VPP, FBUSTX, FBUSRX, MBUS, and BSI signals.

When the phone enters flash programming mode, the prommer indicates to the UEM that flash programming will take place by writing an 8-bit password to the UEM. A prommer first sets the BSI to "1", uses FBUSRX for writing, and uses the MBUS for clocking. The BSI is then set back to "0".

The MCU uses the FBUSTX signal to indicate to the prommer that it has been noticed. Then the MCU reports the UPP type ID and is ready to receive the secondary boot code in its internal SRAM.

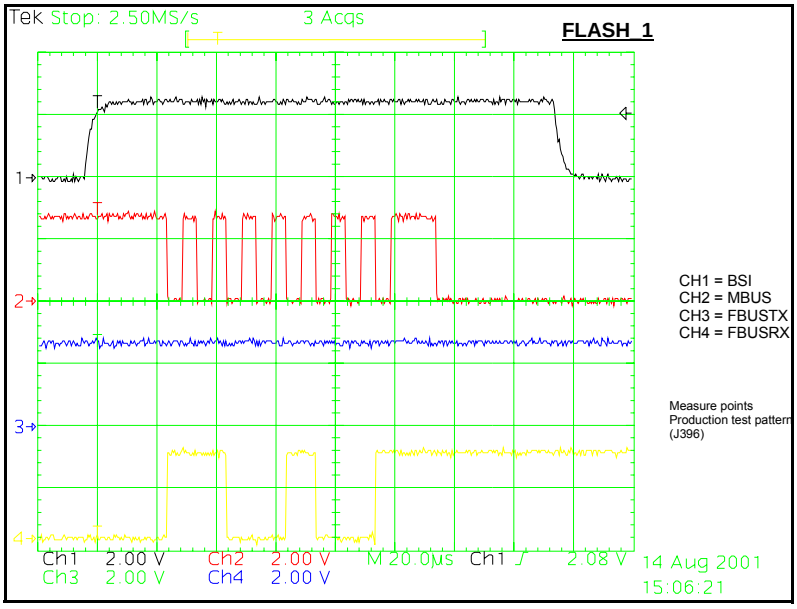


Figure 10: Flashing start

This boot code asks the MCU to report the prommer phone's configuration information, including the flash device type. Now the prommer can select and send the algorithm code to the MCU SRAM (and SRAM/Flash self-tests can be executed).

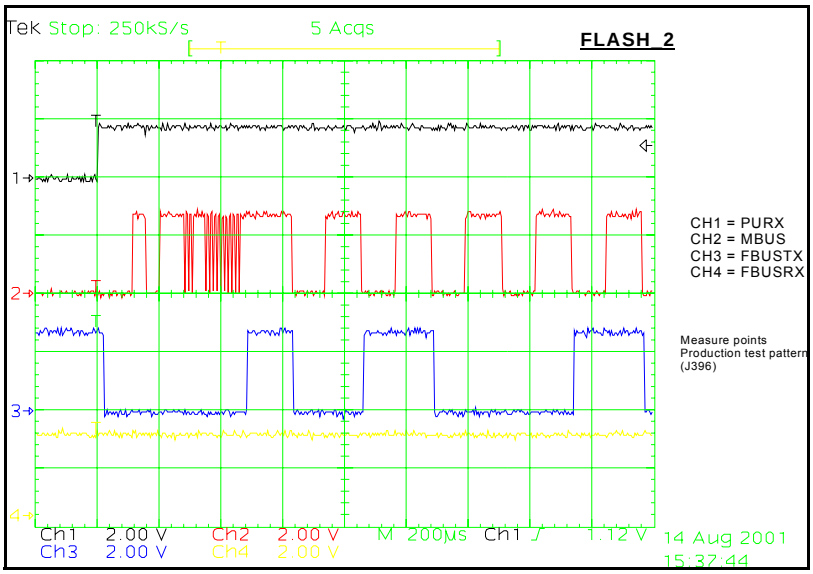


Figure 11: Flashing, continued 1

- Ch1-> PURX
- Ch2-> MBUS toggled three times for MCU initialization
- Ch3-> FBUS_TX low, MCU indicates that prommer has been noticed
- Ch4-> FBUS_RX

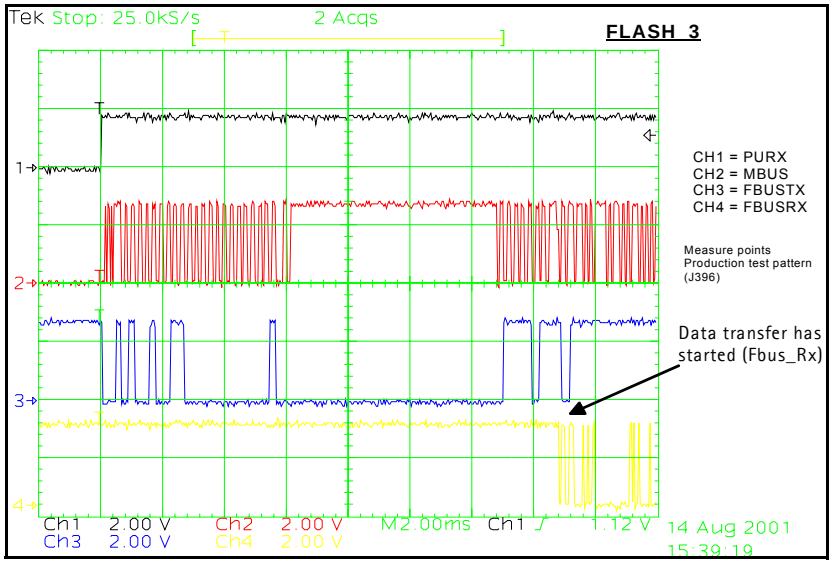


Figure 12: Flashing, continued 2

Flash Programming Error Codes

The following characteristics apply to the information in Table 3.

- Error codes can be seen from the test results or from Phoenix's flash-tool*.
- Underlined information means that the connection under consideration is being used for the first time.

Table 3: Flash Programming Error Codes

Error	Description	Not Working Properly
C101	"The Phone does not set FbusTx line high after the startup."	Vflash1 VBatt BSI and FbusRX from prommer to UEM. FbusTx from UPP->UEM->Prommer(SA0)
C102	"The Phone does not set FbusTx line low after the line has been high. The Prommer generates this error also when the Phone is not connected to the Prommer."	PURX (also to Safari) VR3 Rfclock(VCTCXO->Safari->UPP) Mbus from Prommer->UEM->UPP(MbusRx)(SA0) FbusTx from UPP->UEM->Prommer(SA1) BSI and FbusRX from prommer to UEM.
C103	" Boot serial line fail."	Mbus from Prommer->UEM->UPP(MbusRx)(SA1) FbusRx from Prommer->UEM->UPP FbusTx from UPP->UEM->Prommer
C104	"MCU ID message sending failed in the Phone."	FbusTx from UPP->UEM->Prommer
C105	"The Phone has not received Secondary boot codes length bytes correctly."	Mbus from Prommer->UEM->UPP(MbusRx) FbusRx from Prommer->UEM->UPP FbusTx from UPP->UEM->Prommer
C106	"The Phone has not received Secondary code bytes correctly."	Mbus from Prommer->UEM->UPP(MbusRx) FbusRx from Prommer->UEM->UPP FbusTx from UPP->UEM->Prommer

Table 3: Flash Programming Error Codes (Continued)

Error	Description	Not Working Properly
C107	"The Phone MCU can not start Secondary code correctly."	UPP
C586	"The erasing status response from the Phone informs about fail."	Flash
C686	"The programming status response from the Phone informs about fail."	Flash
Cx81	"The Prommer has detected a checksum error in the message, which it has received from the Phone."	FbusTx from UPP->UEM->Prommer
Cx82	"The Prommer has detected a wrong ID byte in the message, which it has received from the Phone."	FbusTx from UPP->UEM->Prommer
A204 Cx83 Cx84 Cx85	"The flash manufacturer and device IDs in the existing algorithm files do not match with the IDs received from the target phone." "The Prommer has not received phone acknowledge to the message." "The phone has generated NAK signal during data block transfer." "Data block handling timeout"	Flash UPP VIO/VANA? Signals between UPP-Flash Mbus from Prommer->UEM->UPP(MbusRx) FbusRx from Prommer->UEM->UPP FbusTx from UPP->UEM->Prommer
Cx87	"Wrong MCU ID."	RFClock UPP(Vcore)
Startup for flashing	Required startup for flashing	Vflash1 VBatt

Charging Operation

Battery

The phone uses a Lithium-Ion cell battery (BL-6C) with a capacity of 1070 mAh. Reading a resistor inside the battery pack on the BSI line indicates the battery size. An NTC resistor close to the SIM connector measures the phone's temperature on the BTEMP line.

Temperature and capacity information are needed for charge control. These resistors are connected to the BSI pins on the UEM. The phone has 100KΩ pull-up resistors for these lines so that they can be read by A/D inputs in the phone.

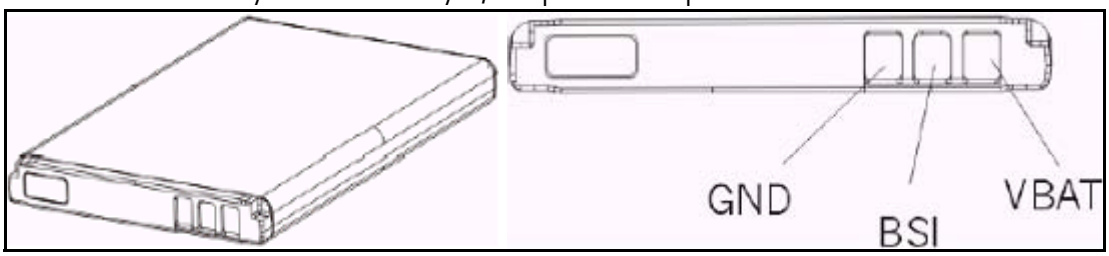


Figure 13: BL-6C battery pack pin order

Charging Circuitry

The UEM ASIC controls charging depending on the charger being used and the battery size. External components are needed for EMC, reverse polarity and transient protection of the input to the baseband module. The charger connection is through the system connector interface. The baseband is designed to support DCT3 chargers from an electrical point of view. Both two-wire and three-wire type chargers are supported. However, 3-wire chargers are treated as 2-wire chargers.

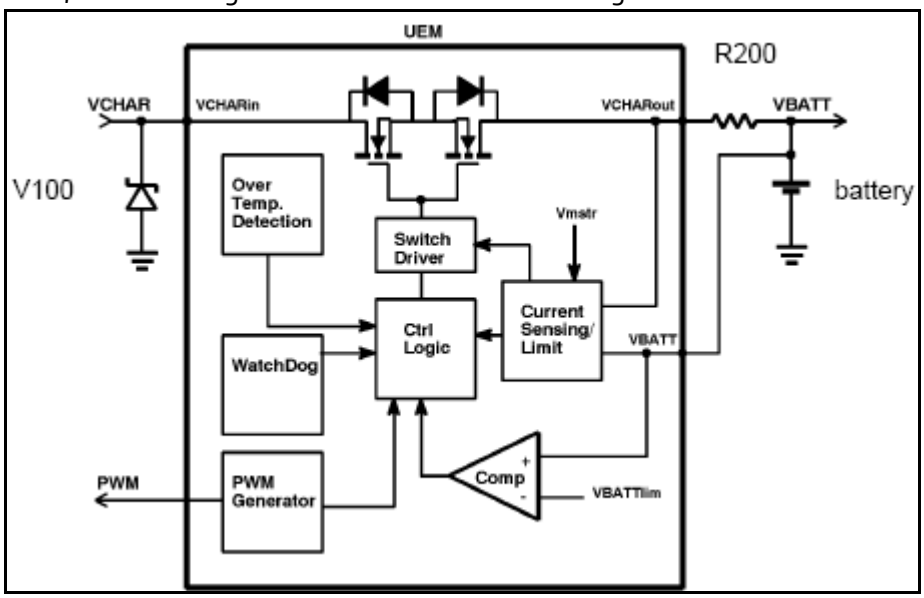


Figure 14: Charging circuitry

Charger Detection

Connecting a charger creates voltage on the VCHAR input of the UEM. Charging starts when the UEM detects that the VCHAR input voltage level is above 2 V (VCHdet+ threshold). The VCHARDET signal is generated to indicate the presence of the charger for the SW. The charger identification/acceptance is controlled by EM SW.

The charger recognition is initiated when the EM SW receives a "charger connected" interrupt. The algorithm basically consists of the following three steps:

1. Check that the charger output (voltage and current) is within safety limits
2. Identify the charger as a 2-wire or 3-wire charger
3. Check that the charger is within the charger window (voltage and current)

If the charger is accepted and identified, the appropriate charging algorithm is initiated.

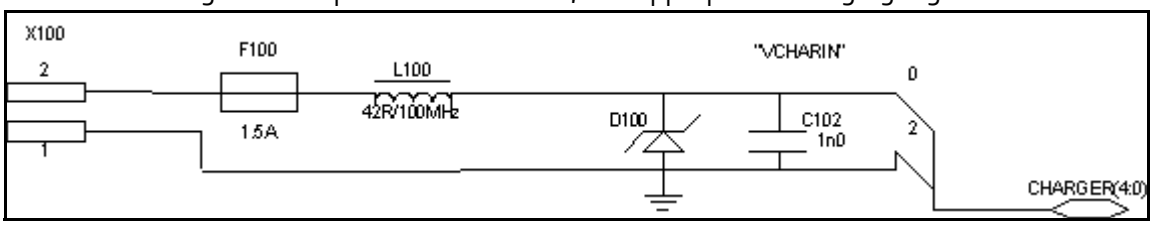


Figure 15: Charging circuit

Charge Control

In active mode, charging is controlled by the UEM's digital part. Charging voltage and current monitoring is used to limit charging into a safe area. For that reason, the UEM has the following programmable, charging cut-off limits:

- VBATLim1=3.6 V (Default)
- VBATLim2L=5.0 V
- VBATLim2H=5.25 V

VBATLim1, 2L, 2H are designed with hystereses. When the voltage rises above VBATLim1, 2L, 2H+ charging is stopped by turning the charging switch off. There is no change in the operational mode. Charging restarts after the voltage decreases below VBATLim-.

Audio

The audio control and processing is supported by the UEM and the UPP. The UEM contains the audio codec. The UPP contains the MCU and DSP blocks, handling and processing the audio data signals.

The baseband supports three microphone inputs and two earpiece outputs. The microphone inputs are:

- MIC1 = Used for the phone's internal microphone
- MIC2 = Used for pop-port audio accessories
- MIC3 = Used for the Universal Headset

Every microphone input can have either a differential or single-ended AC connection to the UEM circuit. The internal microphone (MIC1) and external microphone (MIC2) are both differential for Tomahawk accessory detection. However, the Universal Headset interface is single-ended. The microphone signals from different sources are connected

to separate inputs at the UEM. Inputs for the microphone signals are differential types. Also, the MICB1 is used for MIC1, and MICB2 is used for both MIC2 and MIC3 (Universal Headset).

The HF single-ended output from the UEM is sent to the input of the MIDI audio amplifier. VBAT supplies the voltage for driving the amplifier, which can be enabled or disabled by the UPP using GenIO (10).

Display and Keyboard

The phone uses LEDs for LCD and keypad illumination. There are three white LEDs for the LCD and two blue LEDs for the keypad, which is a separate board for the UI.

The phone also includes a 96X68 color LCD. The interface utilizes a 9-bit data transfer and is similar to the DCT3-type interface, except the Command/Data information is transferred together with the data.

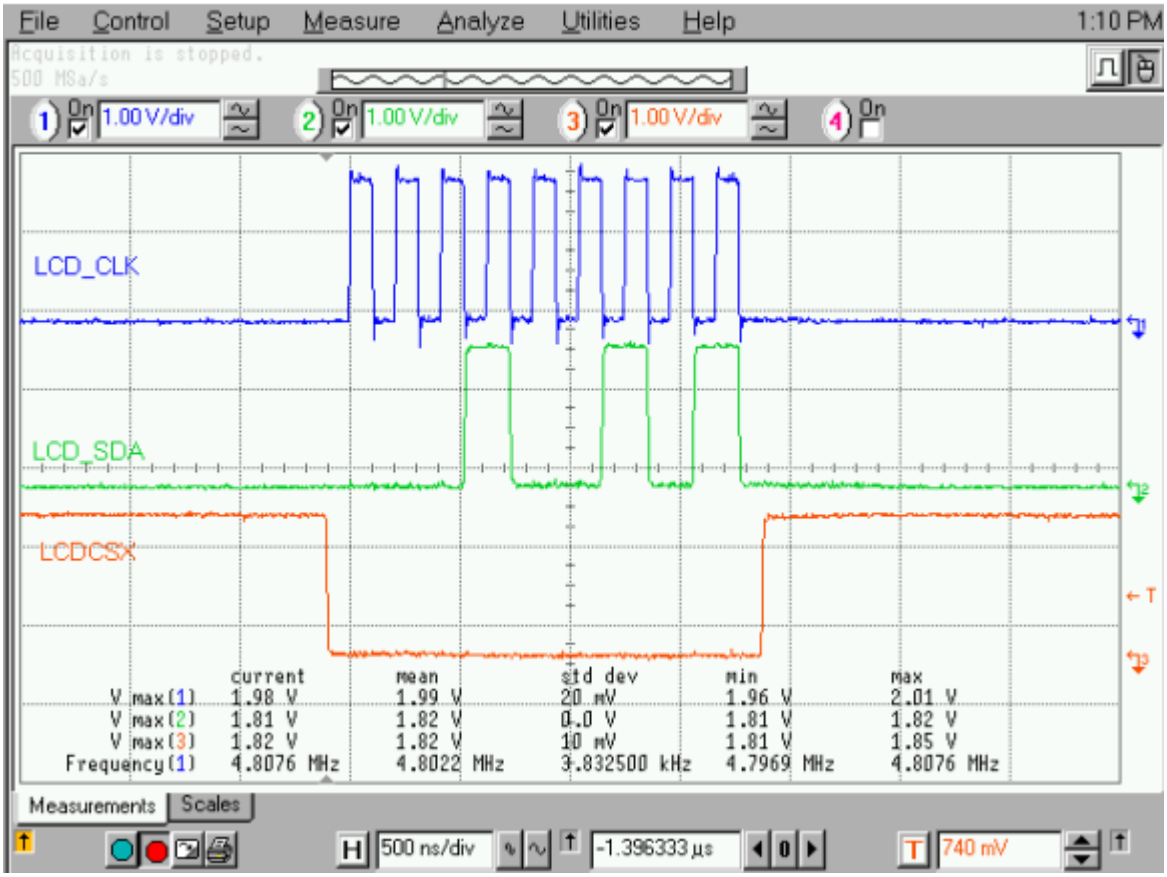
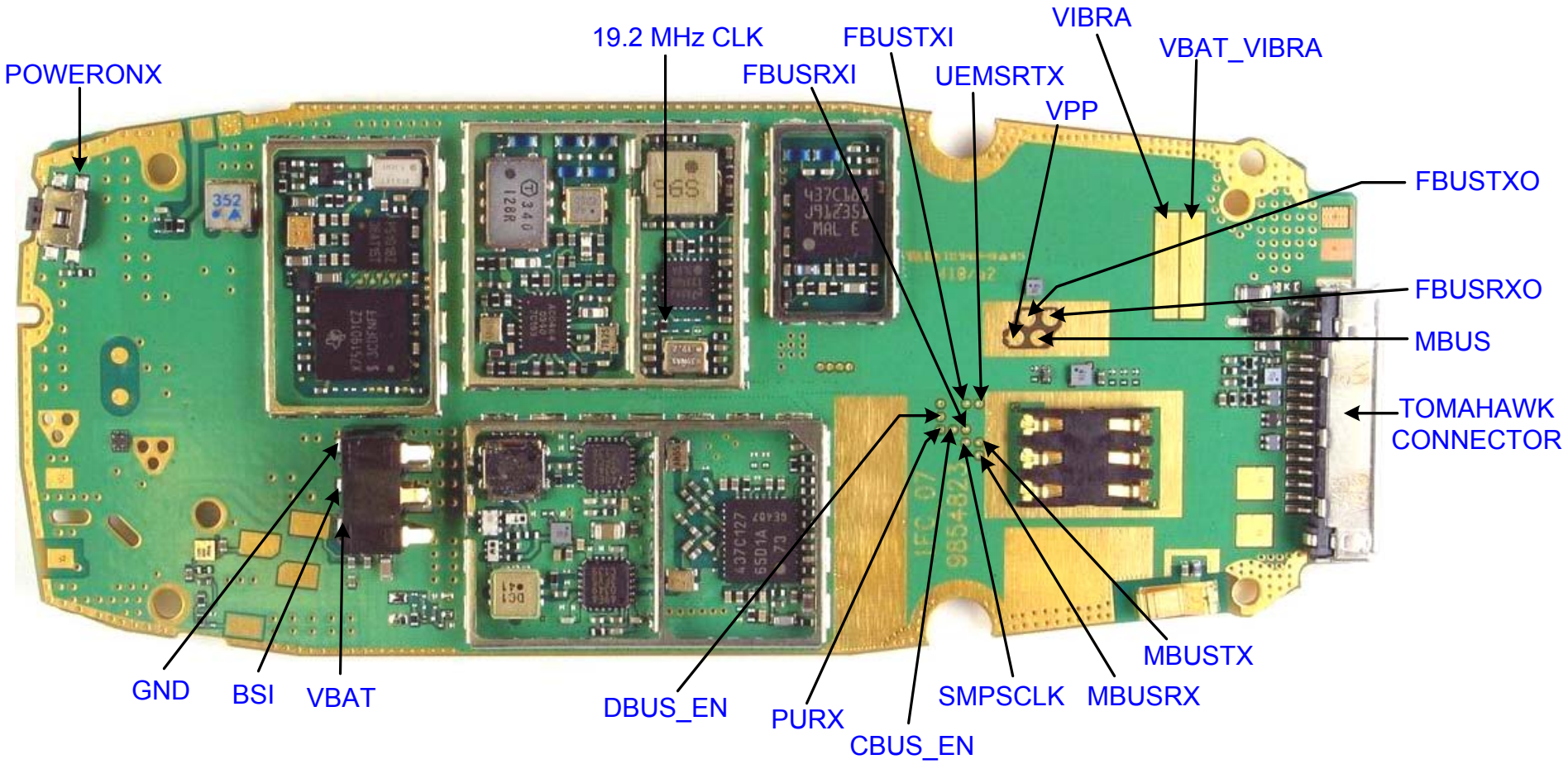

File Control Setup Measure Analyze Utilities Help
1:10 PM
1.00 V/div
1.00 V/div
1.00 V/div
LCD_CLK
LCD_SDA
LCDCSX
current mean std dev min max
V max(1) 1.98 V 1.99 V 20 mV 1.96 V 2.01 V
V max(2) 1.81 V 1.82 V 0.0 V 1.81 V 1.82 V
V max(3) 1.82 V 1.82 V 10 mV 1.81 V 1.85 V
Frequency(1) 4.8076 MHz 4.8022 MHz 3.832500 kHz 4.7969 MHz 4.8076 MHz
Measurements
Scales
500 ns/div
-1.396333 µs
740 mV

Figure 16: D/C bit set during each transmitted byte

BB Test Points

Following are the top and bottom views of the BB test points, regulators, and BB ASICs.

Top View



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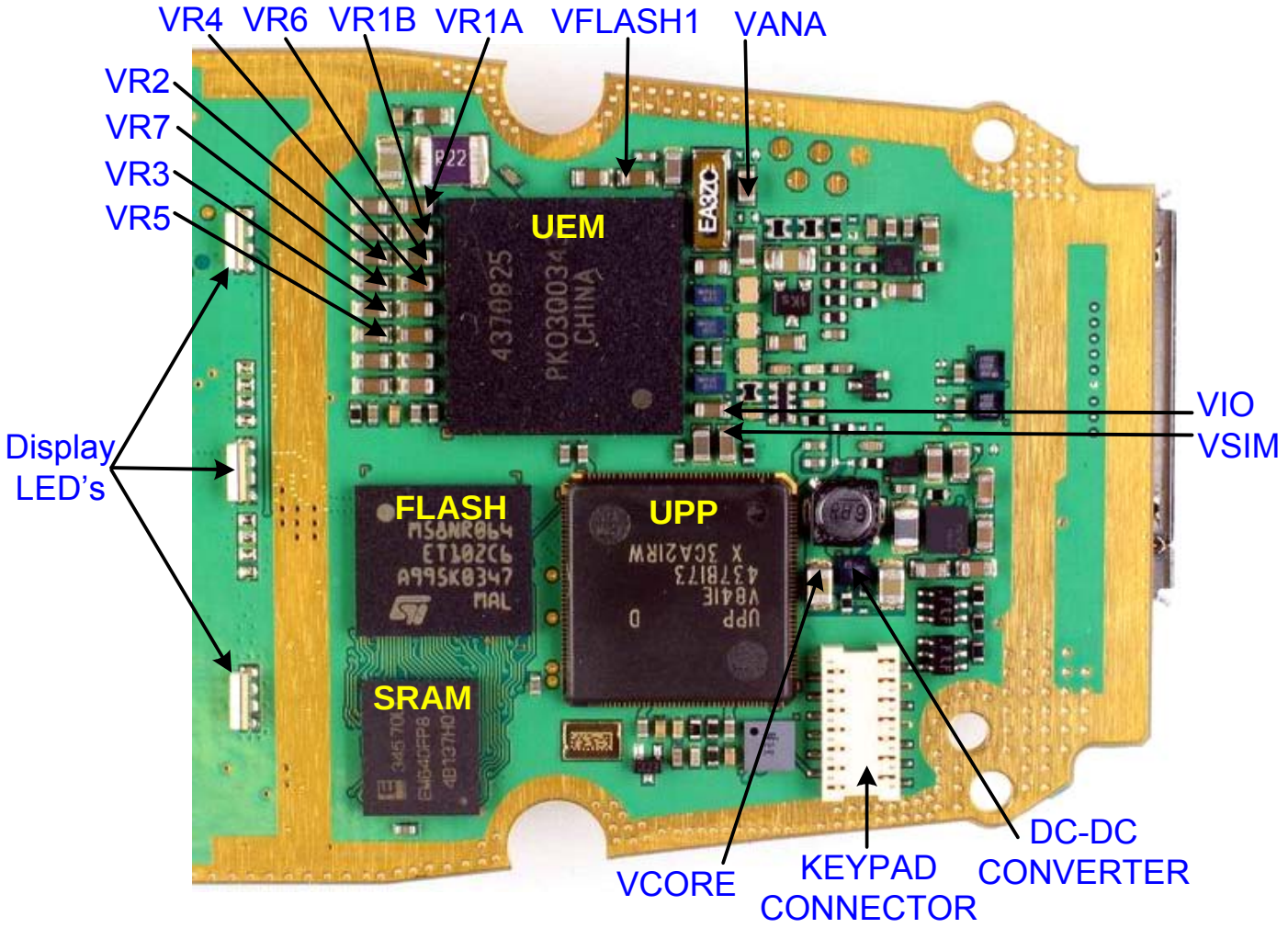
Bottom View



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GPS Module (6015i/6016i/6019i)

The GPS circuitry utilizes RF signals from satellites stationed in geosynchronous orbit to determine longitude and latitude of the handset. The GPS circuitry is completely separate of the CE circuitry and is located almost exclusively on the secondary side of the PWB underneath the display module.

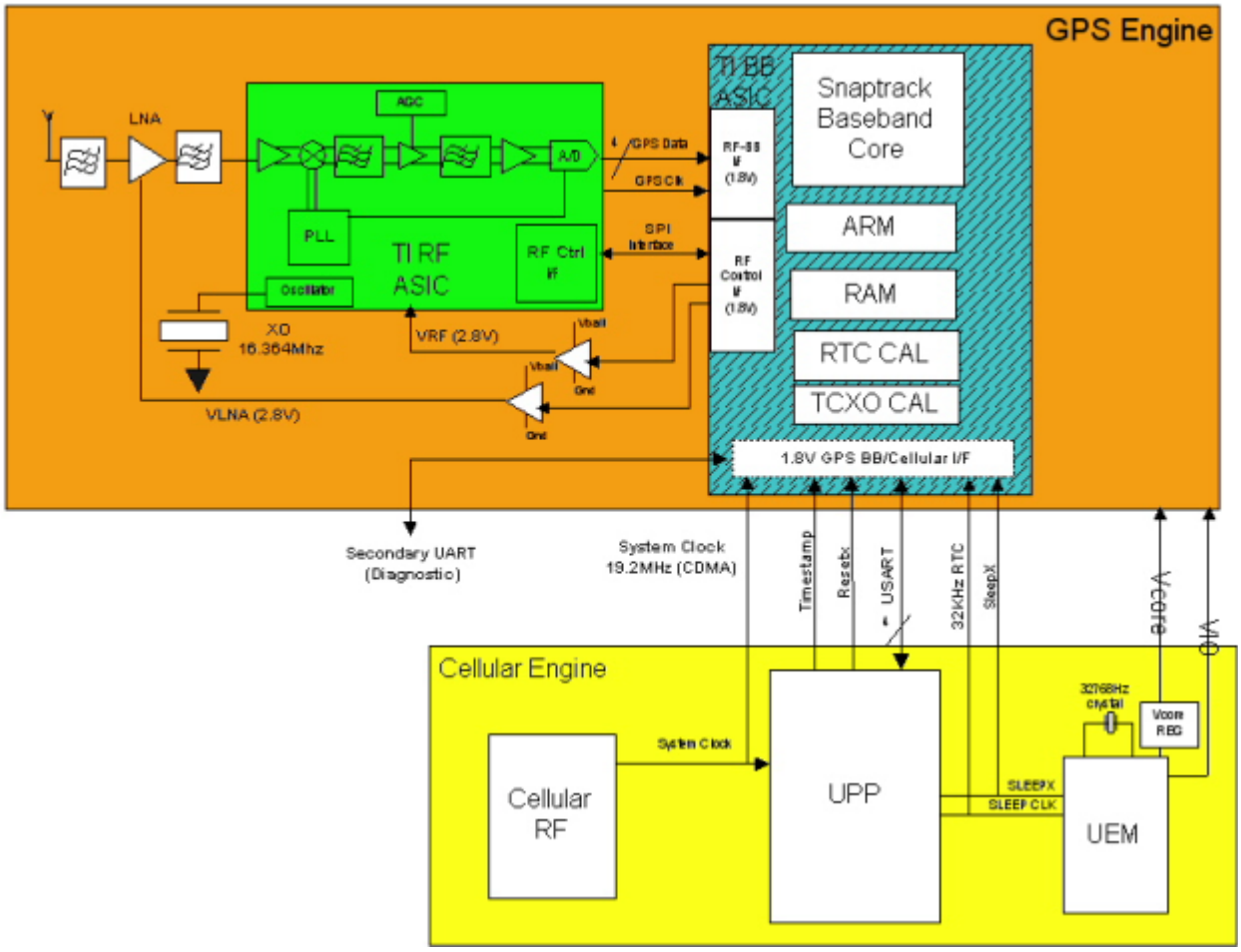
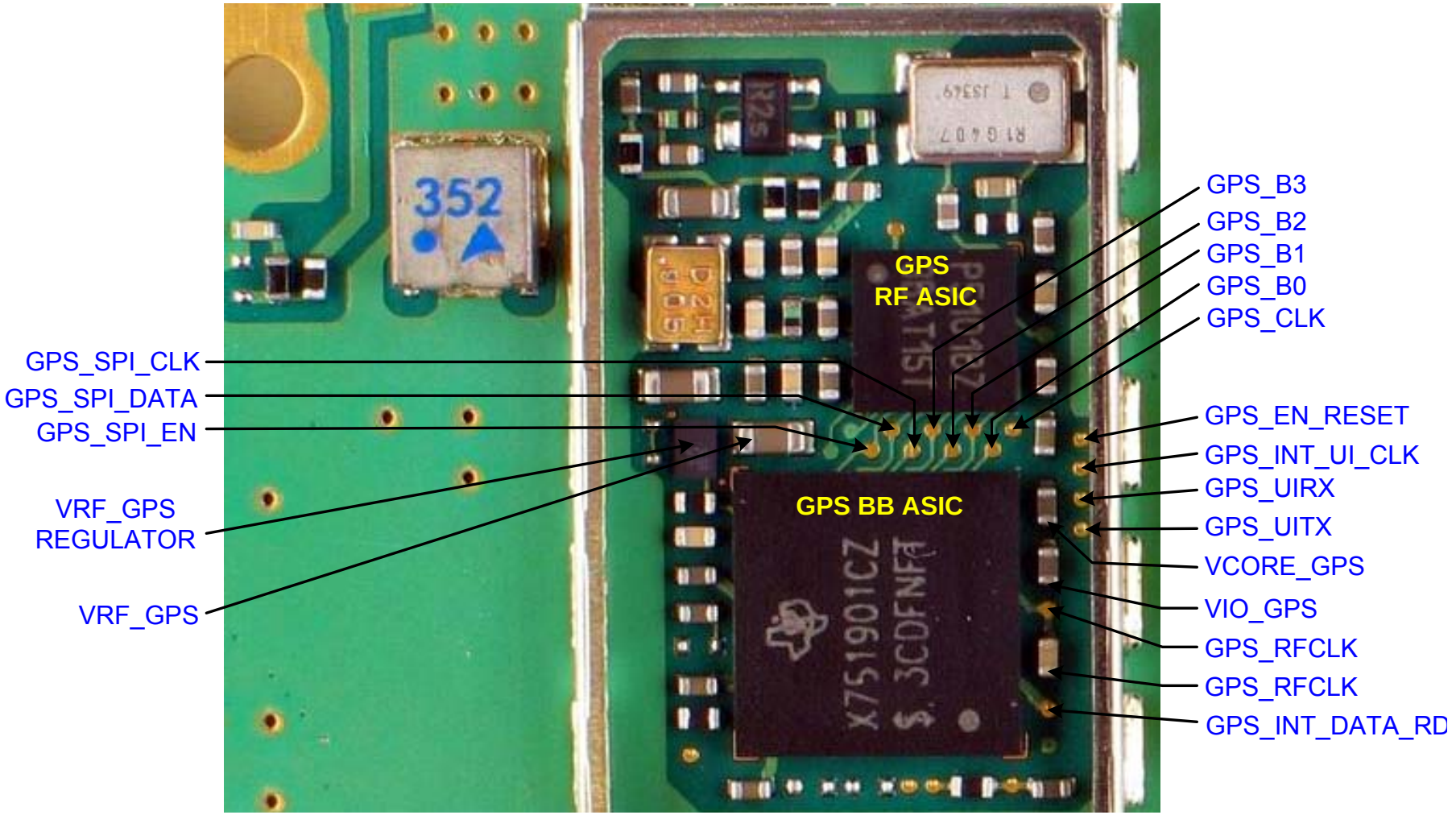


Figure 17: GPS block diagram

To troubleshoot the GPS BB:

1. Perform a visual inspection on the GPS circuitry to see if the problem is physical (dislodged parts, corrosion, poor solder joints, etc.).
2. Put the GE and CE in the proper mode.
3. Check to make sure that necessary inputs from the CE are good (power, clock, etc.).
4. Ensure that the inputs produce the proper outputs. Because of the large level of integration (most functionality is contained in the two ASIC chips), the amount of diagnostics you can perform are limited.

GPS Test Points



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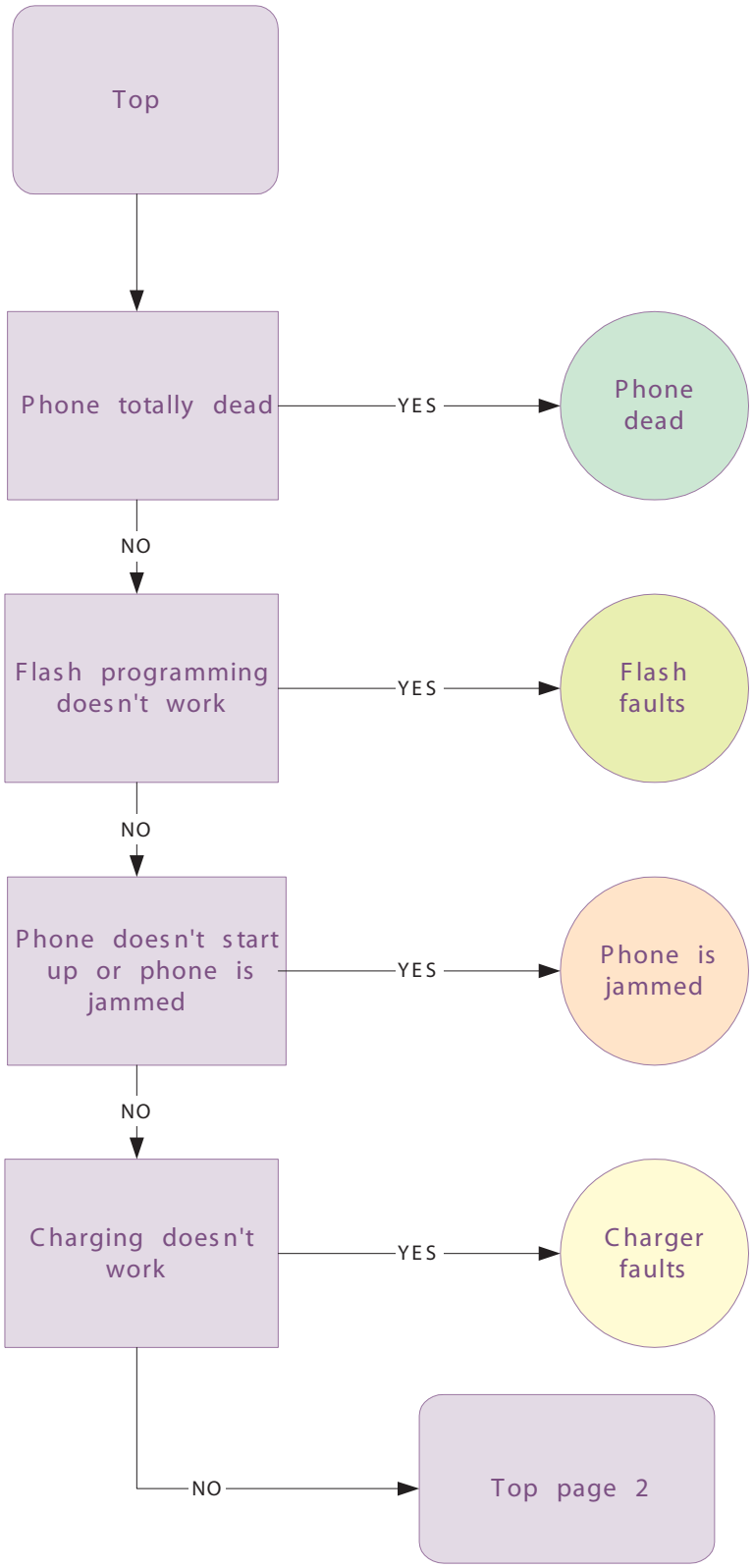
Top Troubleshooting Map



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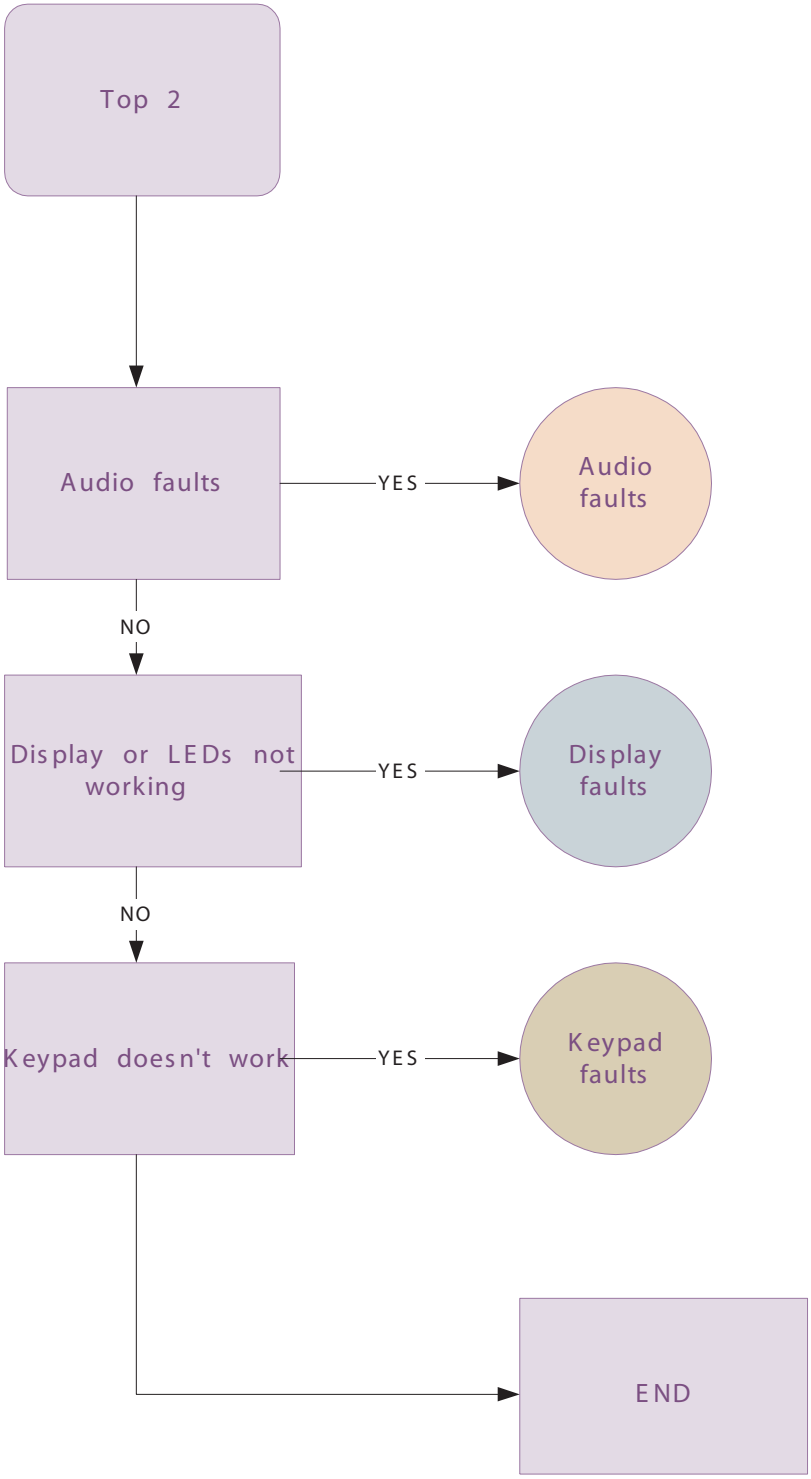
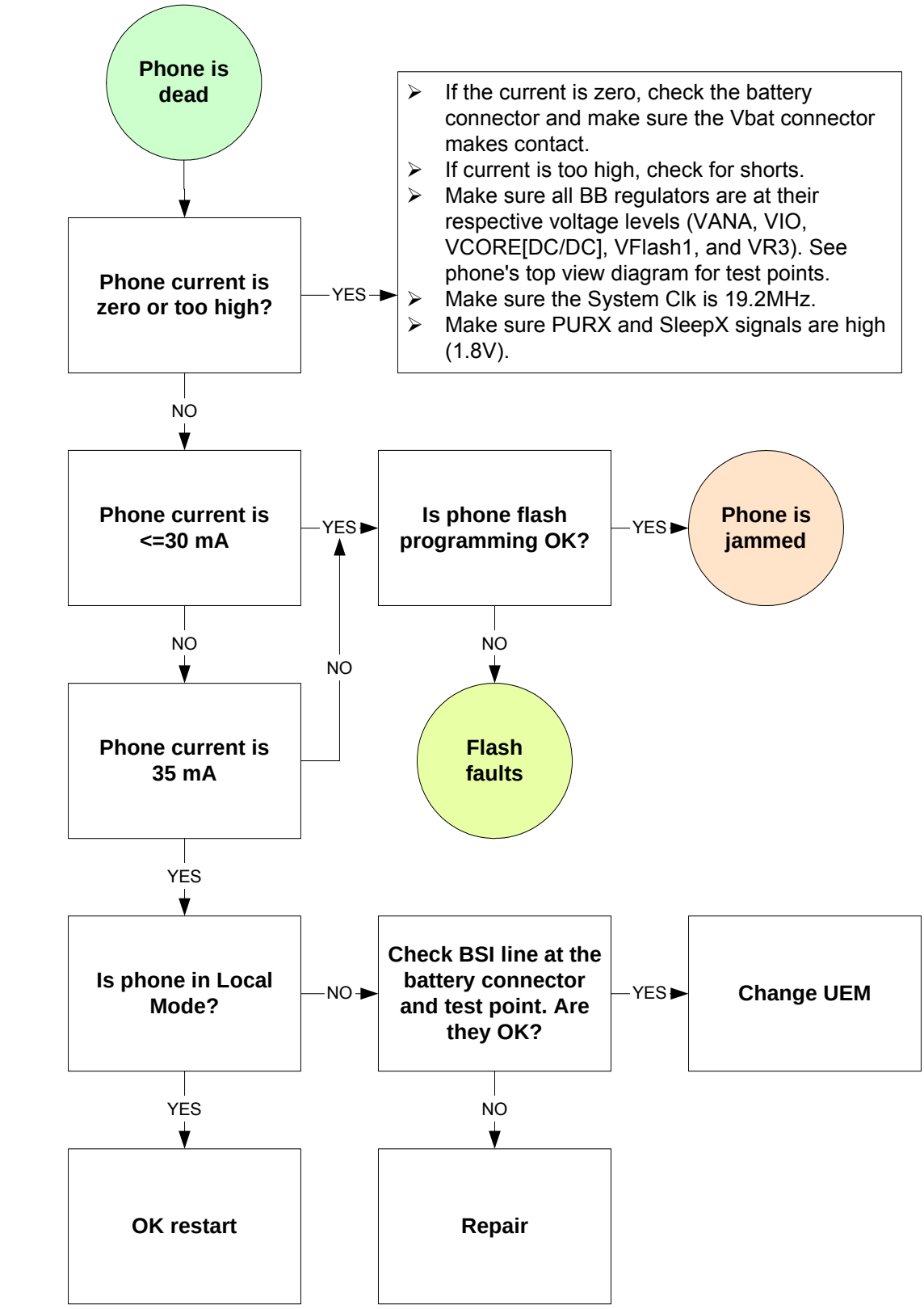

Top 2
Audio faults
YES
Audio faults
NO
Display or LEDs not working
YES
Display faults
NO
Keypad doesn't work
YES
Keypad faults
END

Phone is Totally Dead


Phone is dead
Phone current is zero or too high?
YES
If the current is zero, check the battery connector and make sure the Vbat connector makes contact.
If current is too high, check for shorts.
Make sure all BB regulators are at their respective voltage levels (VANA, VIO, VCORE[DC/DC], VFlash1, and VR3). See phone's top view diagram for test points.
Make sure the System Clk is 19.2MHz.
Make sure PURX and SleepX signals are high (1.8V).
NO
Phone current is <=30 mA
YES
Is phone flash programming OK?
YES
Phone is jammed
NO
NO
NO
Phone current is 35 mA
Flash faults
YES
Is phone in Local Mode?
NO
Check BSI line at the battery connector and test point. Are they OK?
YES
Change UEM
YES
NO
OK restart
Repair

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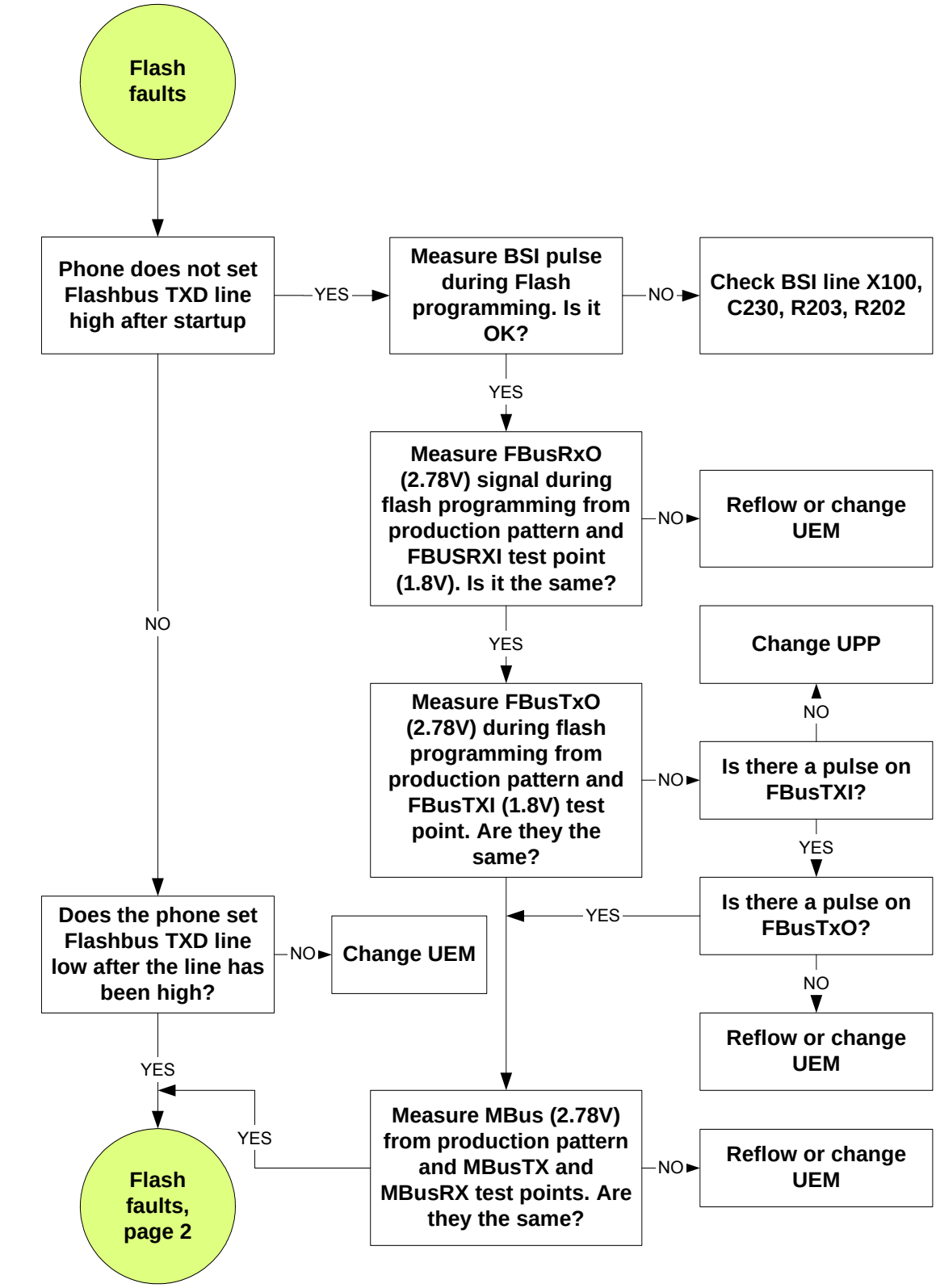
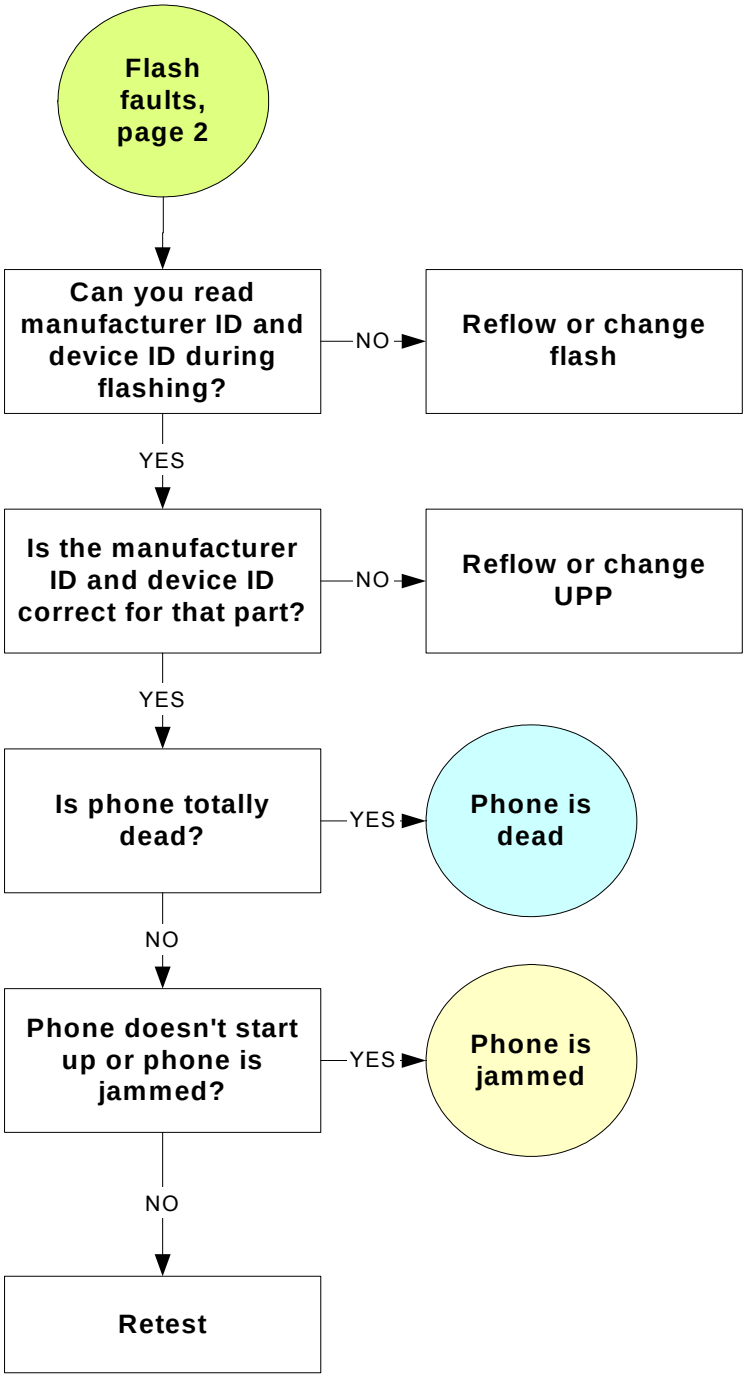
Flash Programming Does Not Work


Flash faults
Phone does not set Flashbus TXD line high after startup
YES
Measure BSI pulse during Flash programming. Is it OK?
NO
Check BSI line X100, C230, R203, R202
YES
Measure FBusRxO (2.78V) signal during flash programming from production pattern and FBUSRXI test point (1.8V). Is it the same?
NO
Reflow or change UEM
NO
YES
Change UPP
Measure FBusTxO (2.78V) during flash programming from production pattern and FBusTXI (1.8V) test point. Are they the same?
NO
Is there a pulse on FBusTXI?
NO
YES
Is there a pulse on FBusTxO?
YES
Does the phone set Flashbus TXD line low after the line has been high?
NO
Change UEM
NO
Reflow or change UEM
YES
YES
Measure MBus (2.78V) from production pattern and MBusTX and MBusRX test points. Are they the same?
NO
Reflow or change UEM
Flash faults, page 2



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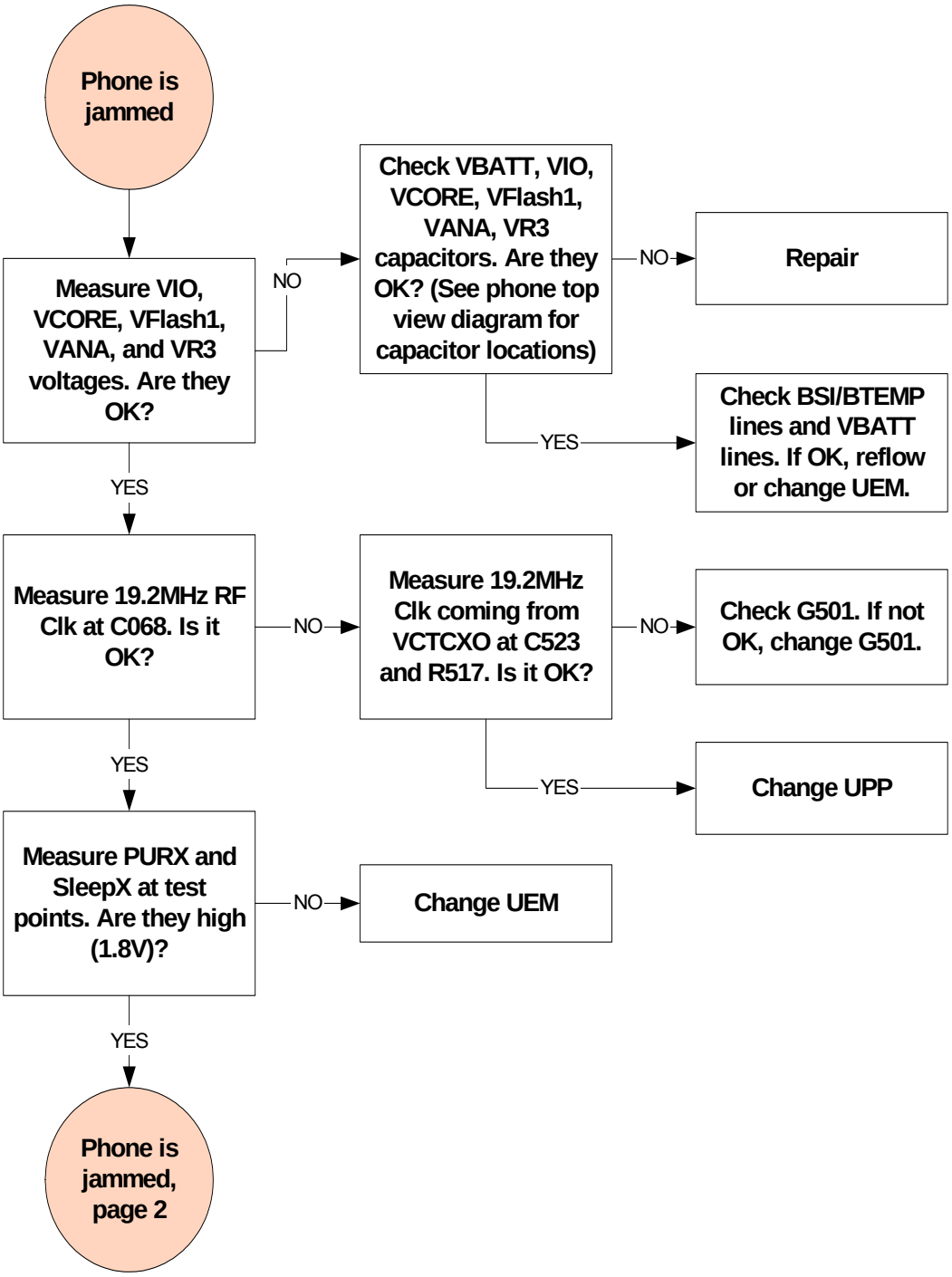
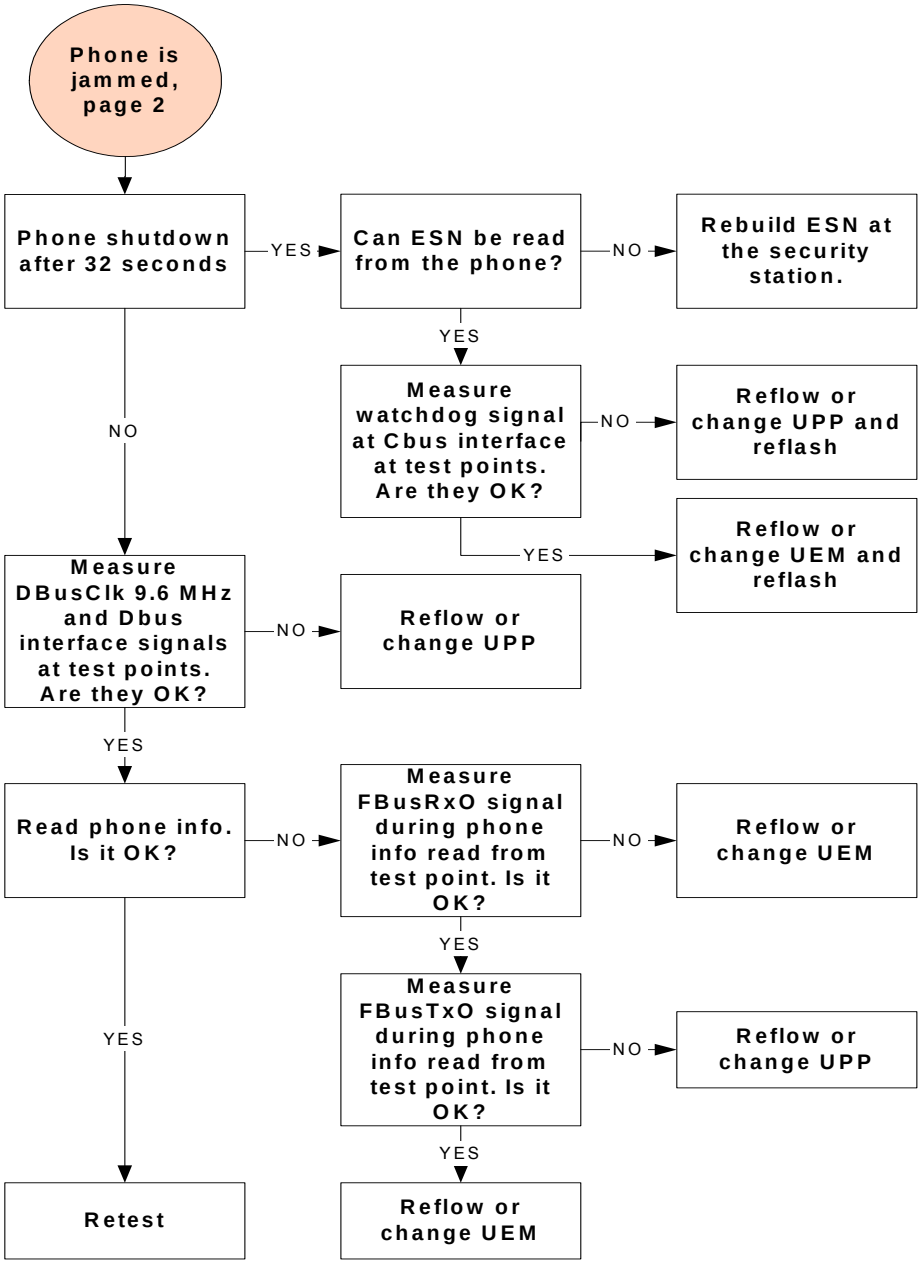
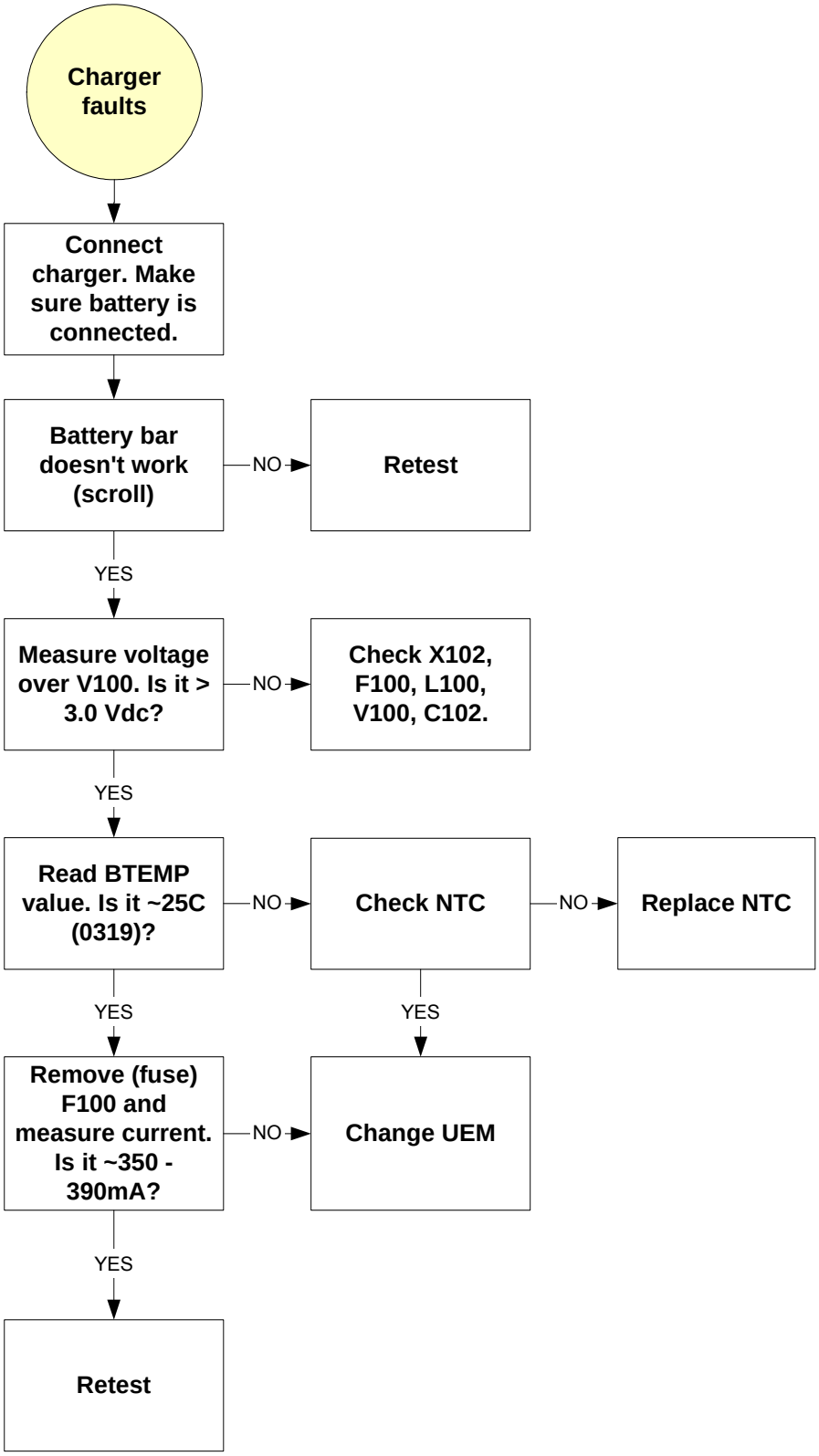
Phone is Jammed


Phone is jammed
Measure VIO, VCORE, VFlash1, VANA, and VR3 voltages. Are they OK?
NO
Check VBATT, VIO, VCORE, VFlash1, VANA, VR3 capacitors. Are they OK? (See phone top view diagram for capacitor locations)
NO
Repair
YES
Check BSI/BTEMP lines and VBATT lines. If OK, reflow or change UEM.
YES
Measure 19.2MHz RF Clk at C068. Is it OK?
NO
Measure 19.2MHz Clk coming from VCTCXO at C523 and R517. Is it OK?
NO
Check G501. If not OK, change G501.
YES
Change UPP
YES
Measure PURX and SleepX at test points. Are they high (1.8V)?
NO
Change UEM
YES
Phone is jammed, page 2

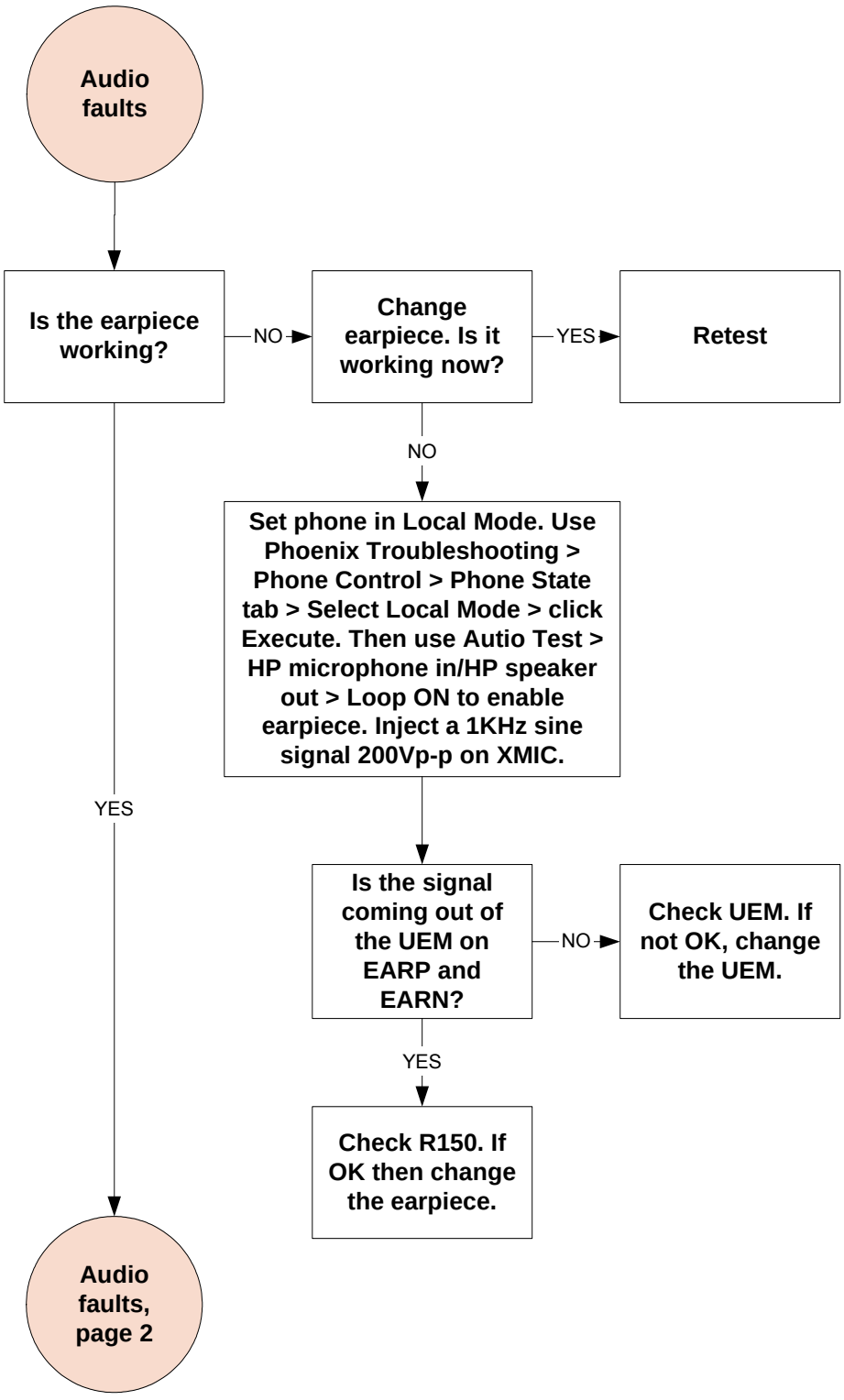

Phone is jammed, page 2
Phone shutdown after 32 seconds
YES
Can ESN be read from the phone?
NO
Rebuild ESN at the security station.
YES
Measure watchdog signal at Cbus interface at test points. Are they OK?
NO
Reflow or change UPP and reflash
YES
Reflow or change UEM and reflash
NO
Measure DBusClk 9.6 MHz and Dbus interface signals at test points. Are they OK?
NO
Reflow or change UPP
YES
Read phone info. Is it OK?
NO
Measure FBusRxO signal during phone info read from test point. Is it OK?
NO
Reflow or change UEM
YES
Measure FBusTxO signal during phone info read from test point. Is it OK?
NO
Reflow or change UPP
YES
Reflow or change UEM
YES
Retest

Charger Faults

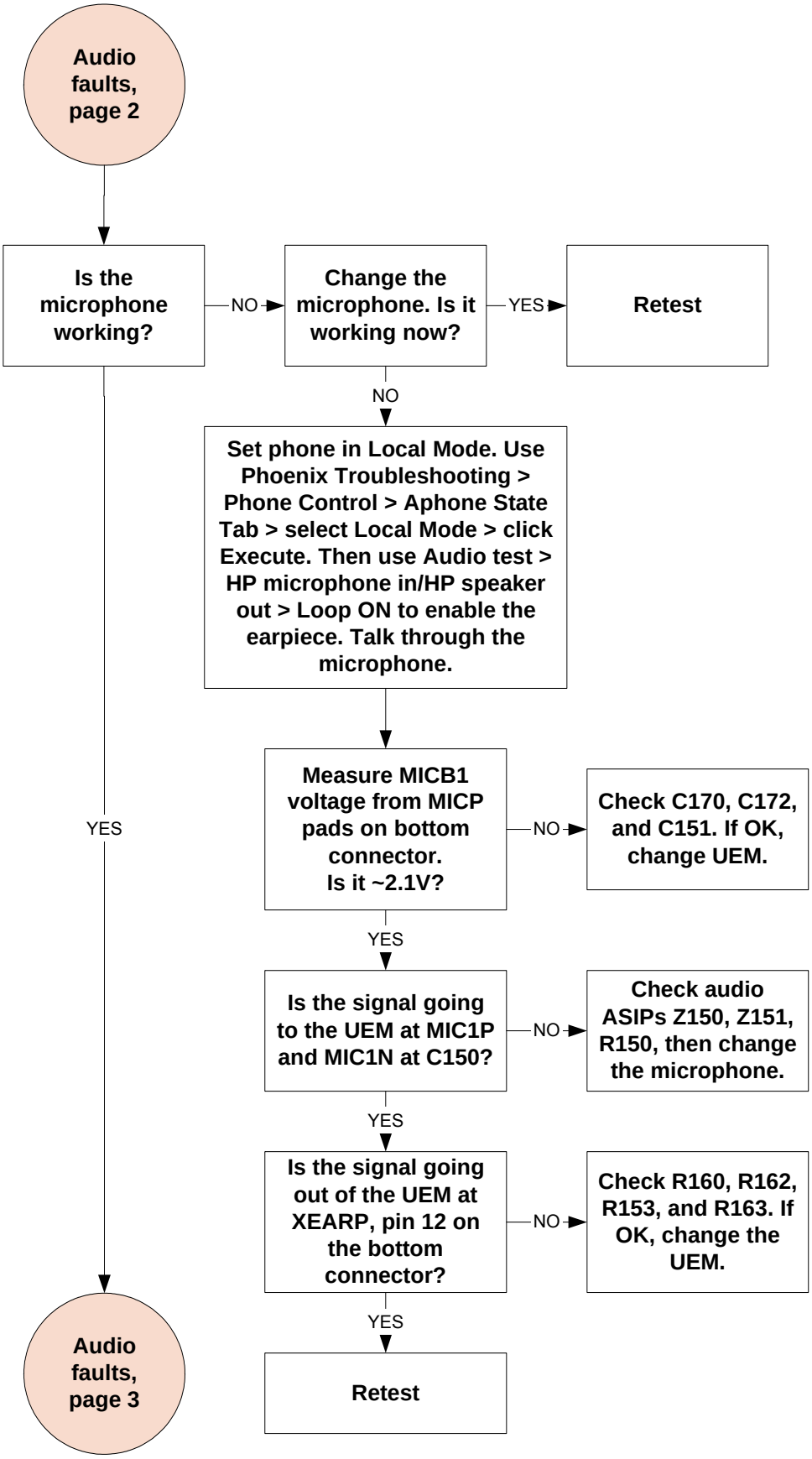


Audio Faults

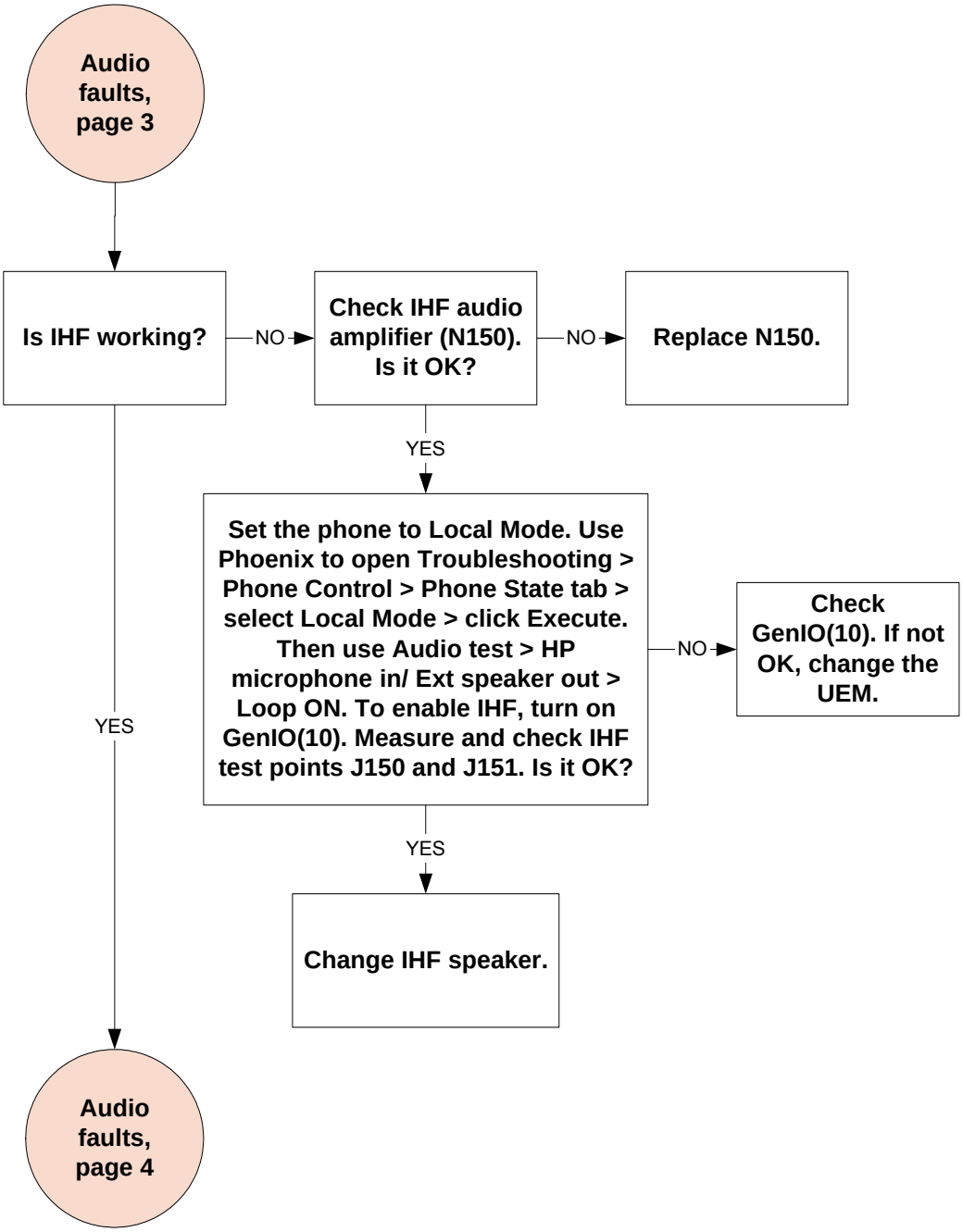
Earpiece


Audio faults
Is the earpiece working?
NO
Change earpiece. Is it working now?
YES
Retest
NO
Set phone in Local Mode. Use Phoenix Troubleshooting > Phone Control > Phone State tab > Select Local Mode > click Execute. Then use Autio Test > HP microphone in/HP speaker out > Loop ON to enable earpiece. Inject a 1KHz sine signal 200Vp-p on XMIC.
YES
Is the signal coming out of the UEM on EARP and EARN?
NO
Check UEM. If not OK, change the UEM.
YES
Check R150. If OK then change the earpiece.
Audio faults, page 2

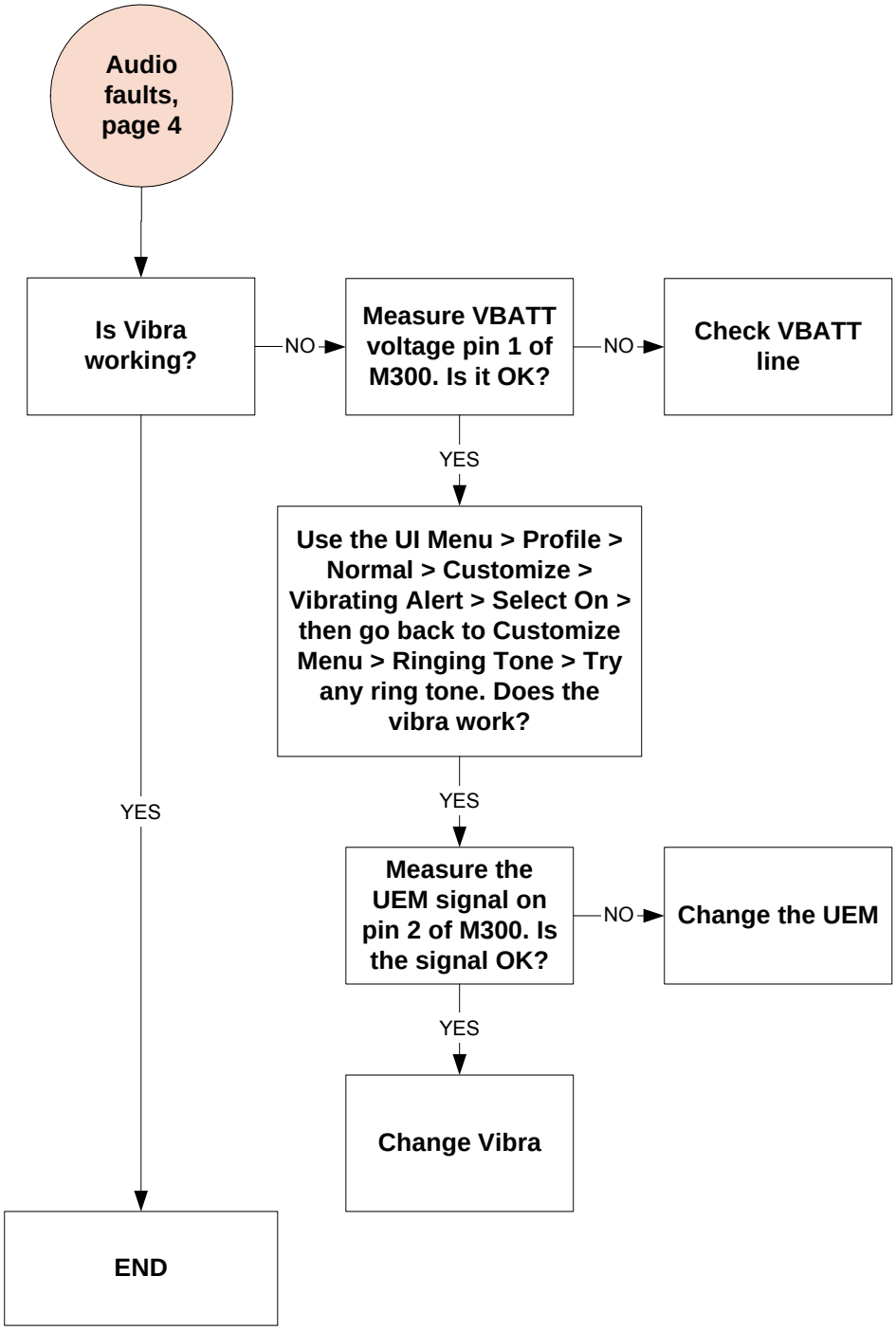
Microphone


Audio faults, page 2
Is the microphone working?
NO
Change the microphone. Is it working now?
YES
Retest
NO
Set phone in Local Mode. Use Phoenix Troubleshooting > Phone Control > Aphone State Tab > select Local Mode > click Execute. Then use Audio test > HP microphone in/HP speaker out > Loop ON to enable the earpiece. Talk through the microphone.
YES
Measure MICB1 voltage from MICP pads on bottom connector. Is it ~2.1V?
NO
Check C170, C172, and C151. If OK, change UEM.
YES
Is the signal going to the UEM at MIC1P and MIC1N at C150?
NO
Check audio ASIPs Z150, Z151, R150, then change the microphone.
YES
Is the signal going out of the UEM at XEARP, pin 12 on the bottom connector?
NO
Check R160, R162, R153, and R163. If OK, change the UEM.
YES
Retest
Audio faults, page 3

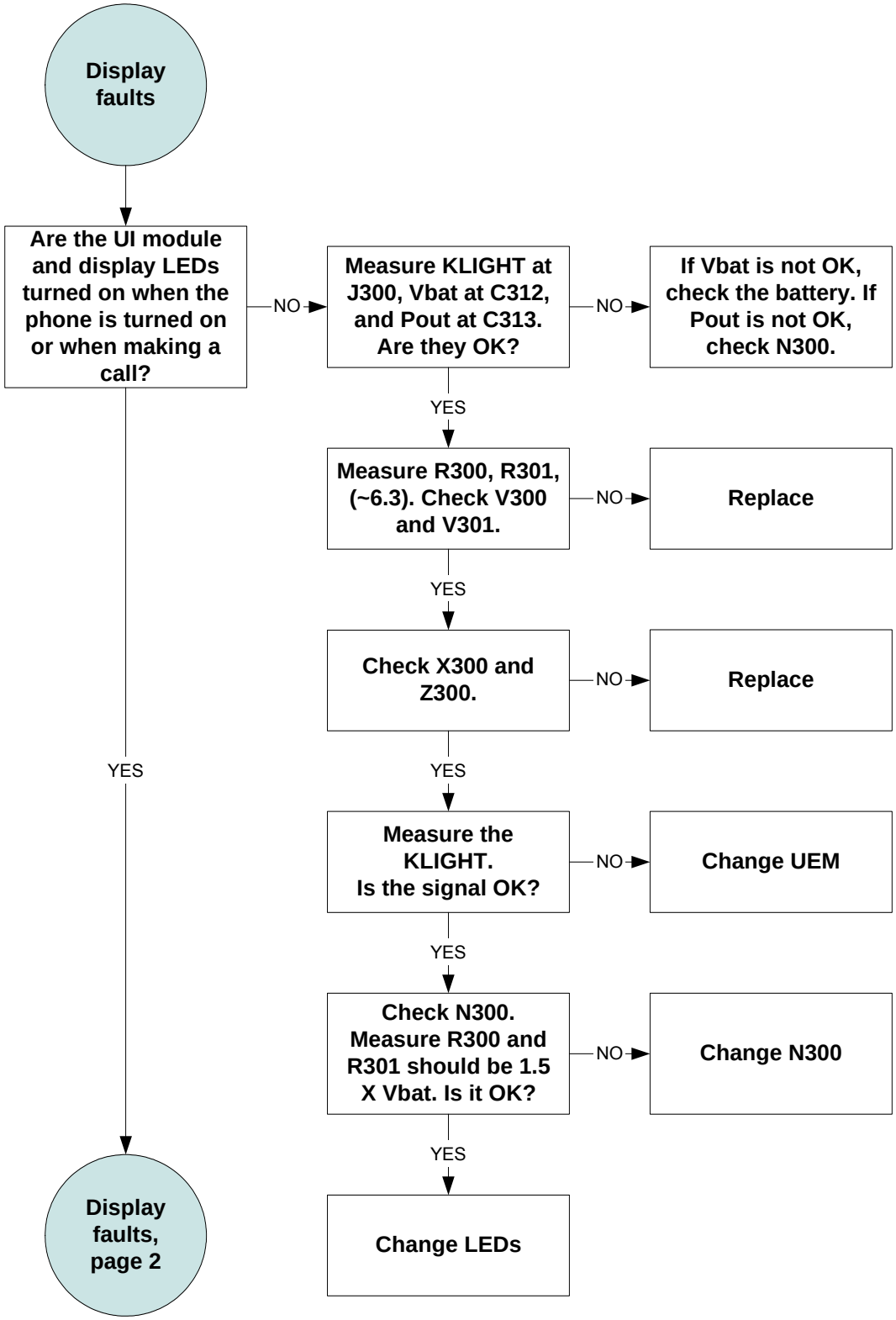
IHF

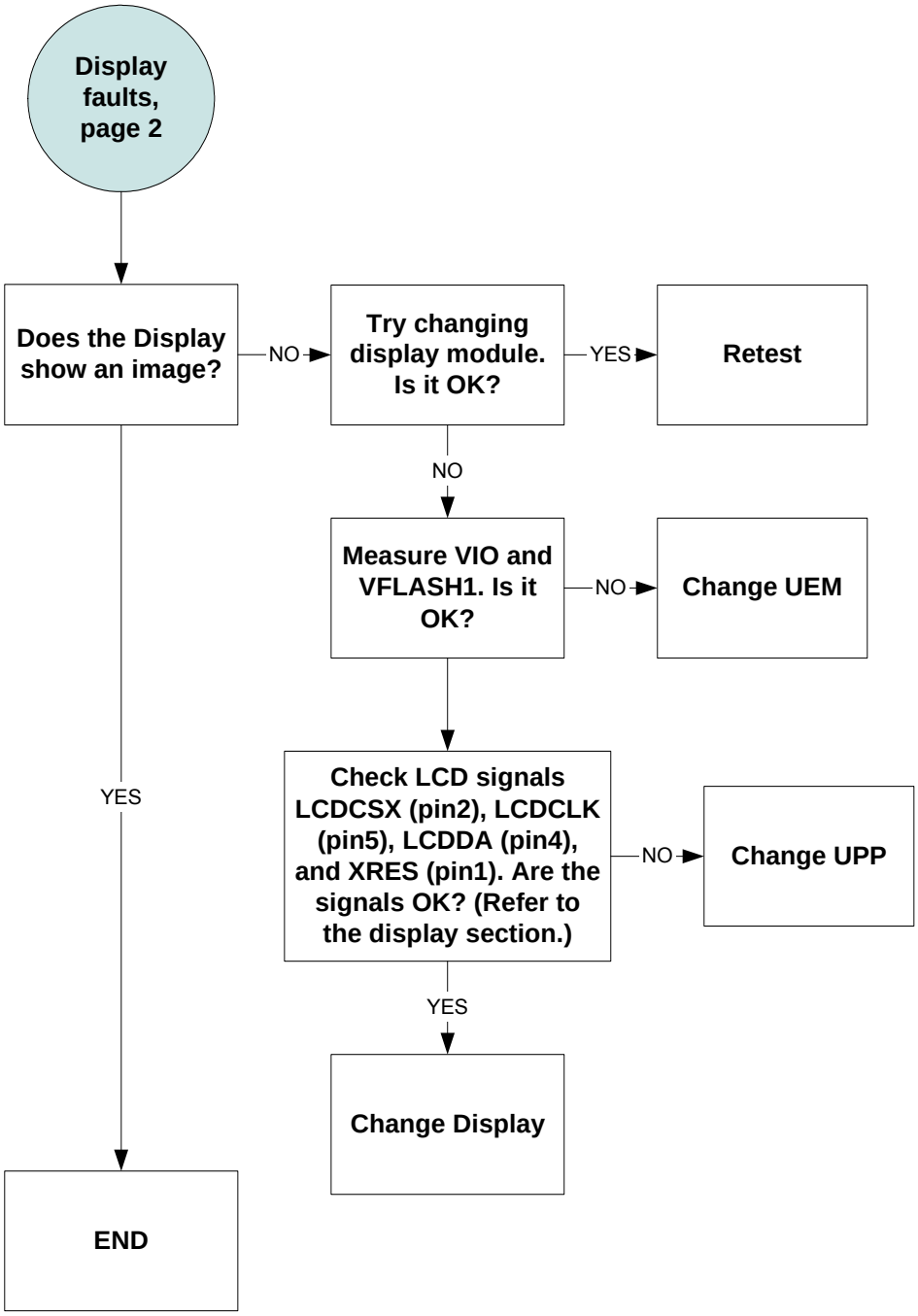

Audio faults, page 3
Is IHF working?
NO
Check IHF audio amplifier (N150). Is it OK?
NO
Replace N150.
YES
Set the phone to Local Mode. Use Phoenix to open Troubleshooting > Phone Control > Phone State tab > select Local Mode > click Execute. Then use Audio test > HP microphone in/ Ext speaker out > Loop ON. To enable IHF, turn on GenIO(10). Measure and check IHF test points J150 and J151. Is it OK?
NO
Check GenIO(10). If not OK, change the UEM.
YES
YES
Change IHF speaker.
Audio faults, page 4

Vibra


Audio faults, page 4
Is Vibra working?
NO
Measure VBATT voltage pin 1 of M300. Is it OK?
NO
Check VBATT line
YES
Use the UI Menu > Profile > Normal > Customize > Vibrating Alert > Select On > then go back to Customize Menu > Ringing Tone > Try any ring tone. Does the vibra work?
YES
YES
Measure the UEM signal on pin 2 of M300. Is the signal OK?
NO
Change the UEM
YES
Change Vibra
END

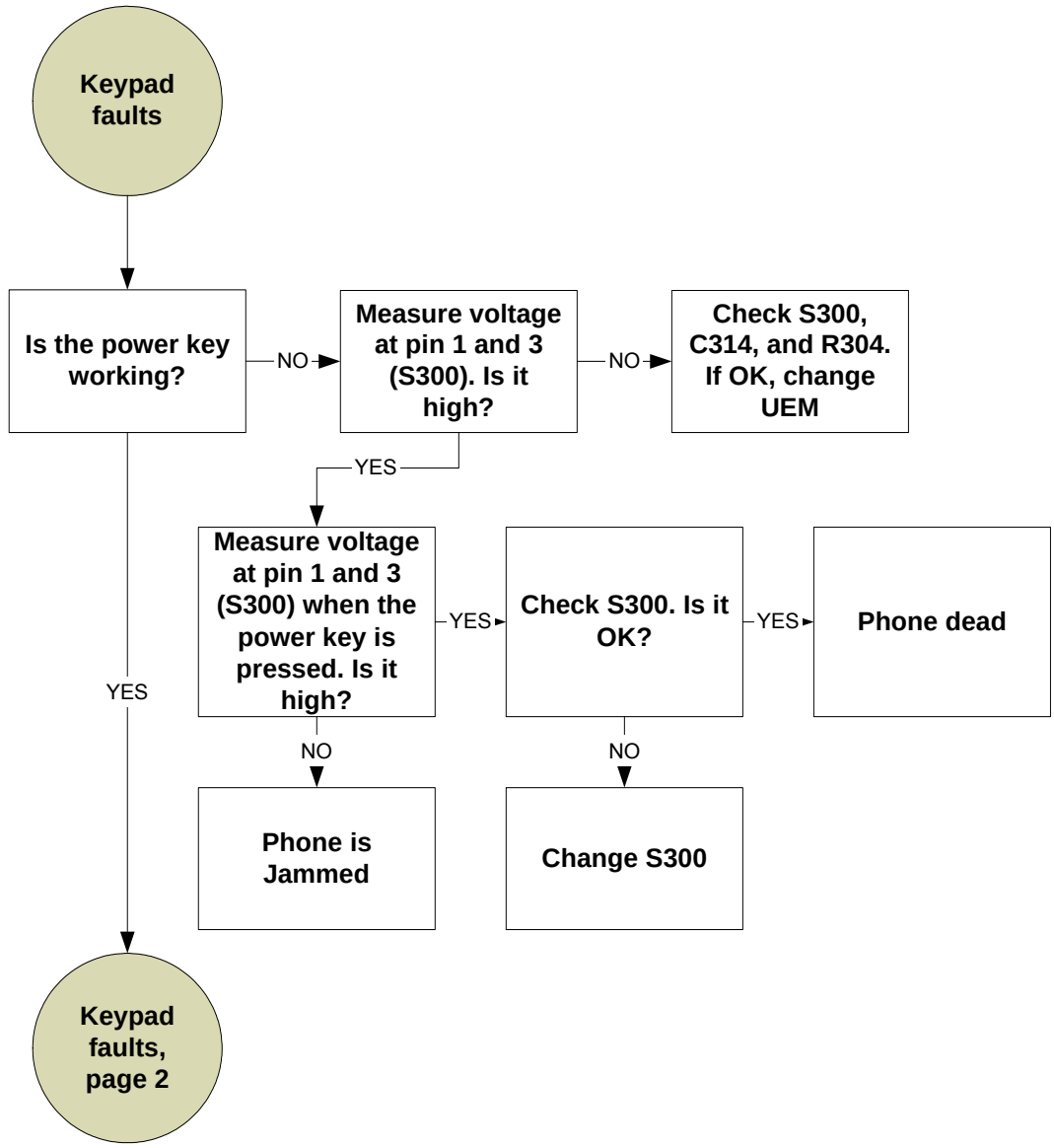
Display Faults


Display faults
Are the UI module and display LEDs turned on when the phone is turned on or when making a call?
NO
Measure KLIGHT at J300, Vbat at C312, and Pout at C313. Are they OK?
NO
If Vbat is not OK, check the battery. If Pout is not OK, check N300.
YES
Measure R300, R301, (~6.3). Check V300 and V301.
NO
Replace
YES
Check X300 and Z300.
NO
Replace
YES
YES
Measure the KLIGHT. Is the signal OK?
NO
Change UEM
YES
Check N300. Measure R300 and R301 should be 1.5 X Vbat. Is it OK?
NO
Change N300
YES
Change LEDs
Display faults, page 2

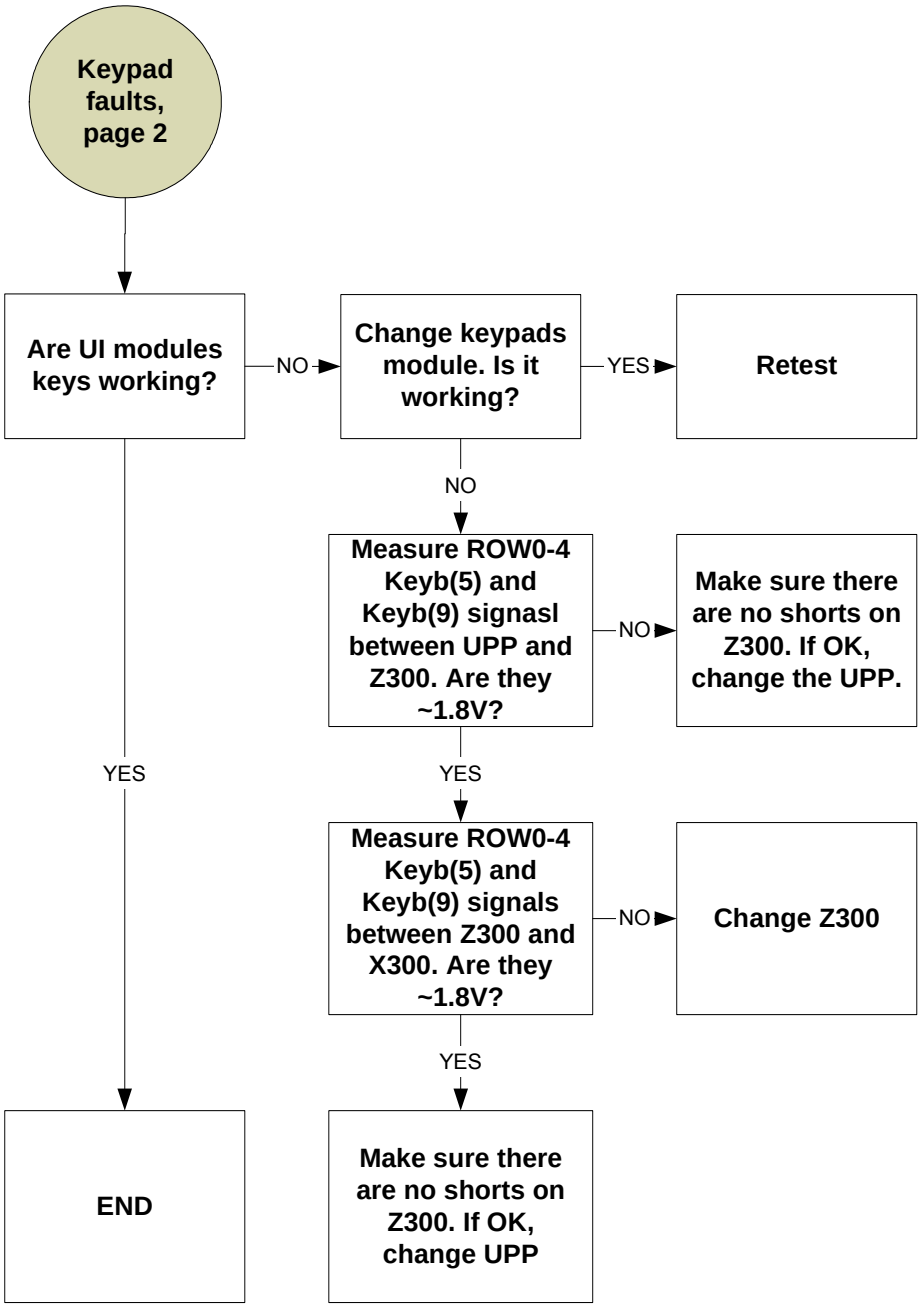

Display faults, page 2
Does the Display show an image?
NO
Try changing display module. Is it OK?
YES
Retest
NO
Measure VIO and VFLASH1. Is it OK?
NO
Change UEM
YES
Check LCD signals LCDCSX (pin2), LCDCLK (pin5), LCDDA (pin4), and XRES (pin1). Are the signals OK? (Refer to the display section.)
NO
Change UPP
YES
Change Display
END

Keypad Faults

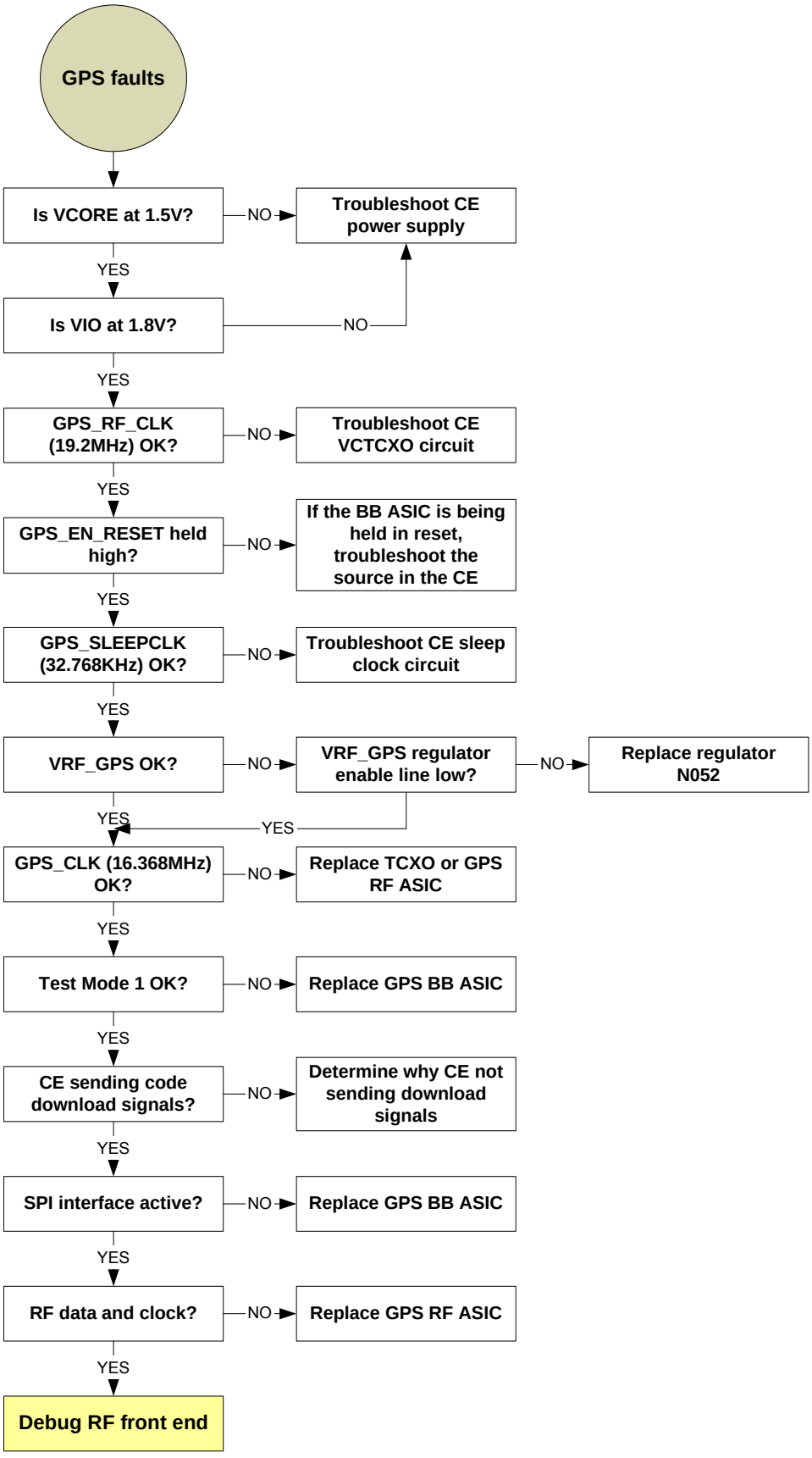
Power Key



UI Modules


Keypad faults, page 2
Are UI modules keys working?
NO
Change keypads module. Is it working?
YES
Retest
NO
Measure ROW0-4 Keyb(5) and Keyb(9) signasl between UPP and Z300. Are they ~1.8V?
NO
Make sure there are no shorts on Z300. If OK, change the UPP.
YES
YES
Measure ROW0-4 Keyb(5) and Keyb(9) signals between Z300 and X300. Are they ~1.8V?
NO
Change Z300
YES
END
Make sure there are no shorts on Z300. If OK, change UPP

GPS


GPS faults
Is VCORE at 1.5V?
NO
Troubleshoot CE power supply
YES
Is VIO at 1.8V?
NO
YES
GPS_RF_CLK (19.2MHz) OK?
NO
Troubleshoot CE VCTCXO circuit
YES
GPS_EN_RESET held high?
NO
If the BB ASIC is being held in reset, troubleshoot the source in the CE
YES
GPS_SLEEPCLK (32.768KHz) OK?
NO
Troubleshoot CE sleep clock circuit
YES
VRF_GPS OK?
NO
VRF_GPS regulator enable line low?
NO
Replace regulator N052
YES
YES
GPS_CLK (16.368MHz) OK?
NO
Replace TCXO or GPS RF ASIC
YES
Test Mode 1 OK?
NO
Replace GPS BB ASIC
YES
CE sending code download signals?
NO
Determine why CE not sending download signals
YES
SPI interface active?
NO
Replace GPS BB ASIC
YES
RF data and clock?
NO
Replace GPS RF ASIC
YES
Debug RF front end

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